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Classifications and Designations of Metric Modulation in the Music of Elliott Carter

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CLASSIFICATIONS AND DESIGNATIONS OF METRIC MODULATION IN THE MUSIC OF ELLIOTT CARTER

by

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ABSTRACT

CLASSIFICATIONS AND DESIGNATIONS OF METRIC MODULATION IN THE MUSIC OF ELLIOTT CARTER

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Since the first use of metric modulation in 1948, this technique has become a staple in Elliott Carter's rhythmic language and compositional process, being found in most of his compositions thereafter. Though most scholars share a general understanding of metric modulation, the different processes that achieve it and its functions are not documented. This thesis will compare and contrast some definitions of metric modulation, formulate a new definition, identify four different types of metric modulation, and explore four ways in which a metric modulation may function in a composition. At the end of said thesis, the usefulness of these types and functions will be demonstrated in an original analysis of *Shard for Guitar Alone*.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

Figure

CHAPTER I

For the past half century, Elliott Carter has been one of the most important composers of contemporary music. Known for his complex scores, Carter's most well-known aspect of composition has been his use of time,[1] more specifically, his use of what scholars have called "metric modulation."[2] Since the first use of metric modulation in 1948, it has become a staple in Carter's rhythmic language, being found in most of his compositions thereafter. Though Carter has been using metric modulation for over sixty years, Carter scholars, such as Richard Goldman, Jonathan Bernard and David Schiff, differ on their definitions of metric modulation. This thesis will compare and contrast their definitions, as well as Carter's own, discuss different types of metric modulations and their uses, and offer my own definition of metric modulation.

In reference to his first string quartet, Carter describes metric modulation as "a procedure in which the tempo or 'beat' speeds up in an ordered manner between measures."[3] Because this definition was published by Carter, himself, not simply offered off-the-cuff in a transcribed interview, it seems like the most reliable source.[4] This

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[1] Jonathan Bernard, "Elliott Carter and the Modern Meaning of Time," *The Musical Quarterly* 79, no. 4 (1995): 644.

[2] Richard Goldman, "The Music of Elliott Carter," *The Musial Quarterly* 43 (January 1951): 151-70.

[3] Elliott Carter, "The Time Dimension in Music," *The Writings of Elliott Carter*, Edited by Else Stone and Kurt Stone, Bloomington: Indiana University Press, 1965: 245.

[4] For other sources pertaining to metric modulations by Carter, see the following: Elliott Carter, *Elliott Carter: In Conversation with Enzo Restagno for Settembre Musica 1989*, Translated by Katherine Silberblatt Wolfthaw, Brooklyn: Institute for Studies in American Music, 1989: 41. Elliott Carter, "Shoptalk by an American Composer," *Collected Essays and Lectures, 1937-1995,* Edited by Jonathan W. Bernard, Rochester: University of Rochester Press, 1997: 217. Elliott Carter, "Music and the Time Screen," *The Writings of Elliott Carter*, Edited by Else Stone and Kurt Stone, Bloomington: Indiana University Press, 1976: 349-50. Allen Edwards, *Flawed Words and Stubborn Sounds: A Conversation with Elliott Carter*, New York: Norton, 1971: 91.

description states that tempo speeds up during a metric modulation, which does not cover situations where the tempo either decelerates or remains constant. Though Carter's definition perfectly describes some instances of metric modulation, other musical passages illustrate quite the opposite. Fig. 1 is taken from the first movement of Carter's *String Quartet No. 1* (1951).[5] During this metric modulation, the pulse speeds up from quarter note = 64 in m. 263 to quarter note = 160 in m. 267. Carter's description of metric modulation works well to explain this musical passage. Not all instances of metric change fit this definition, however. Fig. 2 is an instance taken from the third movement of Carter's *Sonata for Violoncello and Piano* (1948)[6] where the tempo modulation occurring at m.10 decelerates from dotted eighth note = 70 to double-dotted eighth note = 60 while the tempo remains constant at 60 and the pulse changes to an eighth in m. 11.

Fig. 1 – *String Quartet No. 1*, I. – mm. 263-267 – Tempo Accelerando

[5] Elliott Carter, *String Quartet No. 1*, New York: Associated Music Publishers, 1951.

[6] Elliott Carter, *Sonata for Violoncello and Piano*, New York: Associated Music Publishers, 1948.

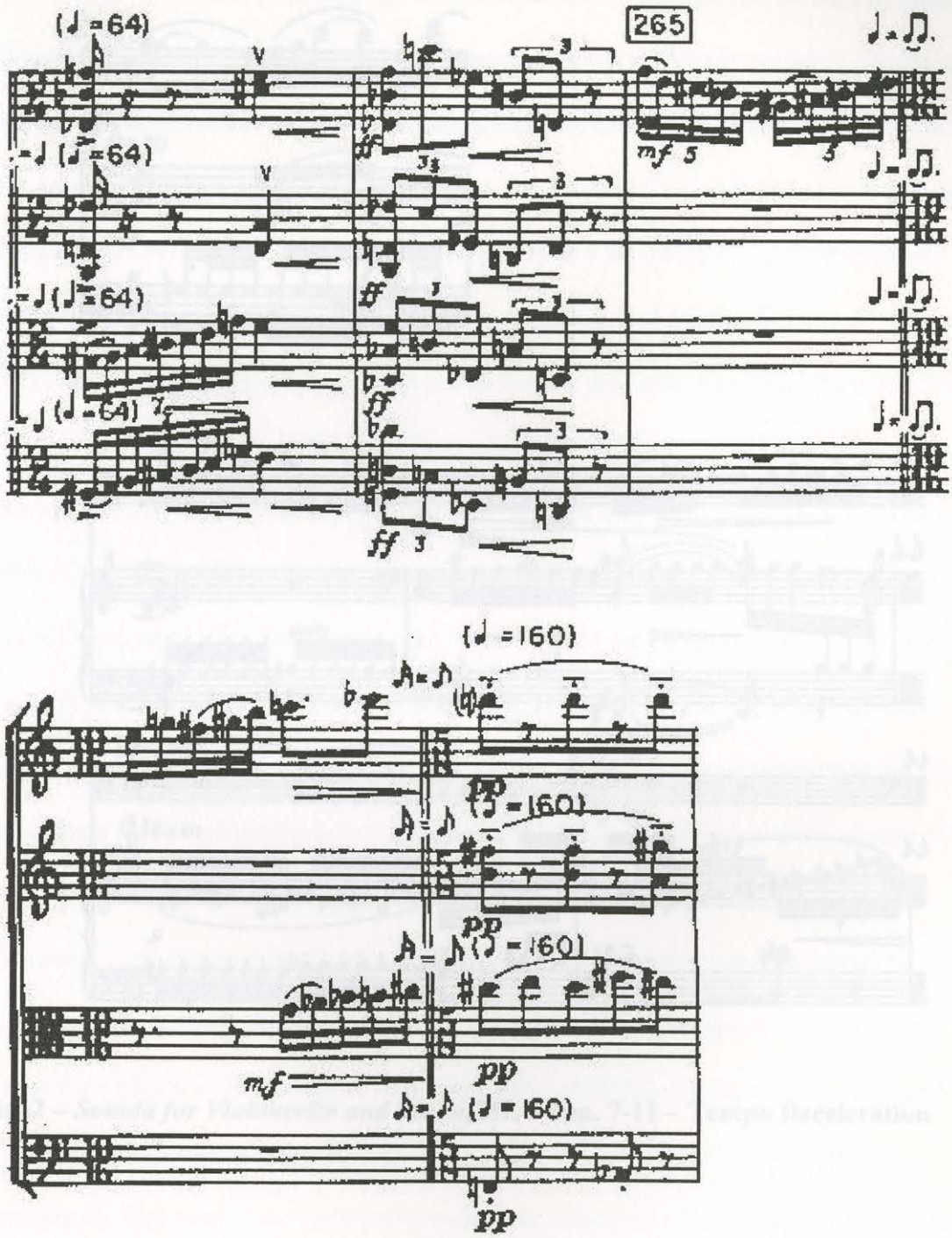

Fig. 1 – *String Quartet No. 1*, I. – mm. 263-267 – Tempo Accelerando

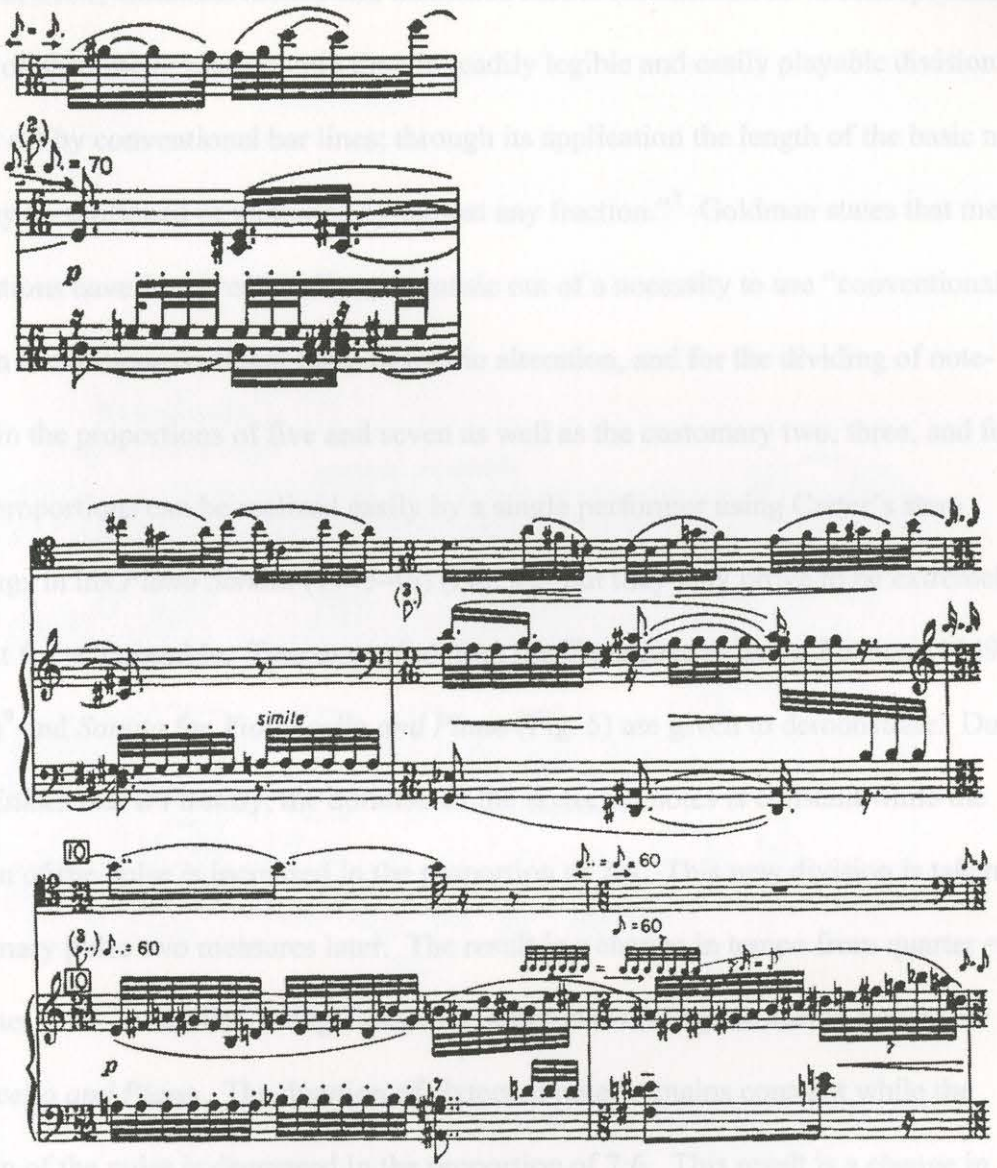

Fig. 2 – *Sonata for Violoncello and Piano*, III. – mm. 7-11 – Tempo Deceleration

In 1951, Goldman named and identified metric modulation as "a concept based on the use of absolute or metronomic time in readily legible and easily playable divisions marked off by conventional bar lines; through its application the length of the basic note unit may be shortened or increased by almost any fraction."[7] Goldman states that metric modulations have "evolved" in Carter's music out of a necessity to use "conventional notation for non-conventional ideas of metric alteration, and for the dividing of note-values in the proportions of five and seven as well as the customary two, three, and four." These proportions can be realized easily by a single performer using Carter's stem groupings in his *Piano Sonata* (1945-46) (Fig. 3),[8] but they may prove to be extremely difficult for an ensemble. Two examples from the *Eight Etudes and a Fantasy* (1949) (Fig. 4)[9] and *Sonata for Violoncello and Piano* (Fig. 5) are given to demonstrate. During *Eight Etudes and a Fantasy*, the duration of the sixteenth notes is constant while the duration of the pulse is increased in the proportion of 7:4. This new division is taken as the primary pulse two measures later. The result is a change in tempo from quarter = 126 to quarter = 72. A similar, though lengthier, process is undergone during *Sonata for Violoncello and Piano*. The duration of sixteenth notes remains constant while the duration of the pulse is decreased in the proportion of 7:6. This result is a change in tempo from eighth = 70 to eighth = 60. Goldman's definition states that the basic note unit may be shortened or increased, but it is unspecific as to how this change is undertaken. One may view Goldman's definition as internally consistent because it does not rule out any method of achieving this change of basic note length. However, this

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[7] Goldman, 87.

[8] Elliott Carter, *Piano Sonata*, New York: Associated Music Publishers, 1946.

[9] Elliott Carter, *Eight Etudes and a Fantasy*, Associated Music Publishers, 1949.

openness also leads a reader to many questions. Is this change of basic note length achieved by manipulating the duration of basic note? Is it achieved by changing the tempo of basic note or some other speed determining factor? A closer study of the different manners and uses of these basic changes offers answers to these questions and greater insight into the music of Carter.

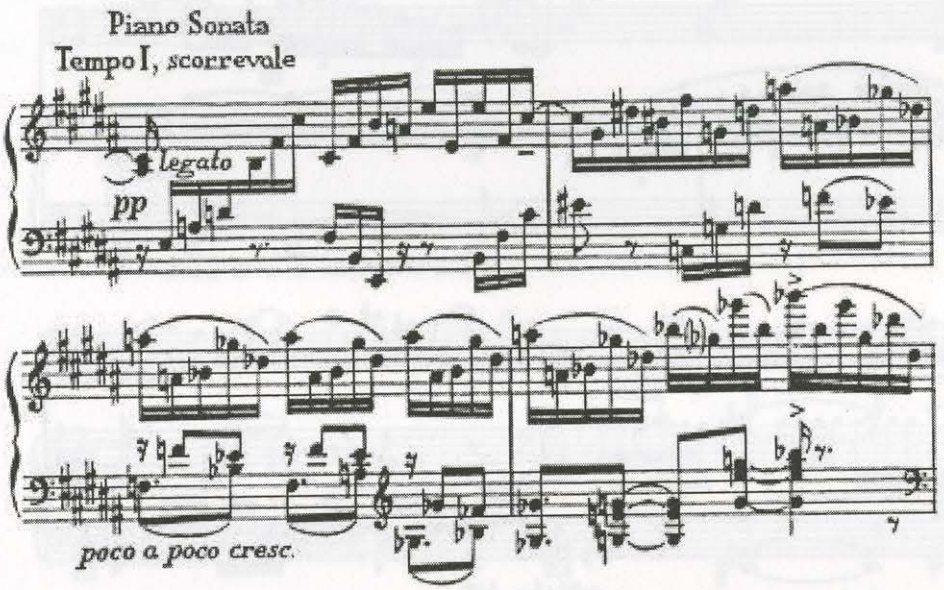

Fig. 3 – *Piano Sonata* – mm. 134-137 – Goldman's Example #1

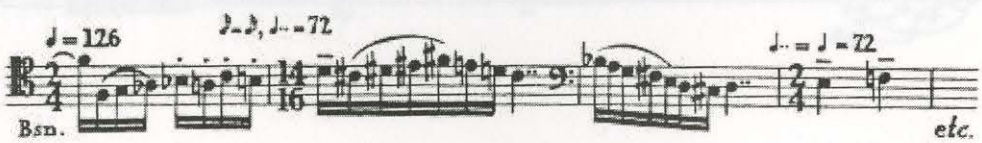

Fig. 4 – *Eight Etudes and a Fantasy* – mm. 31-34 – Goldman's Example #2

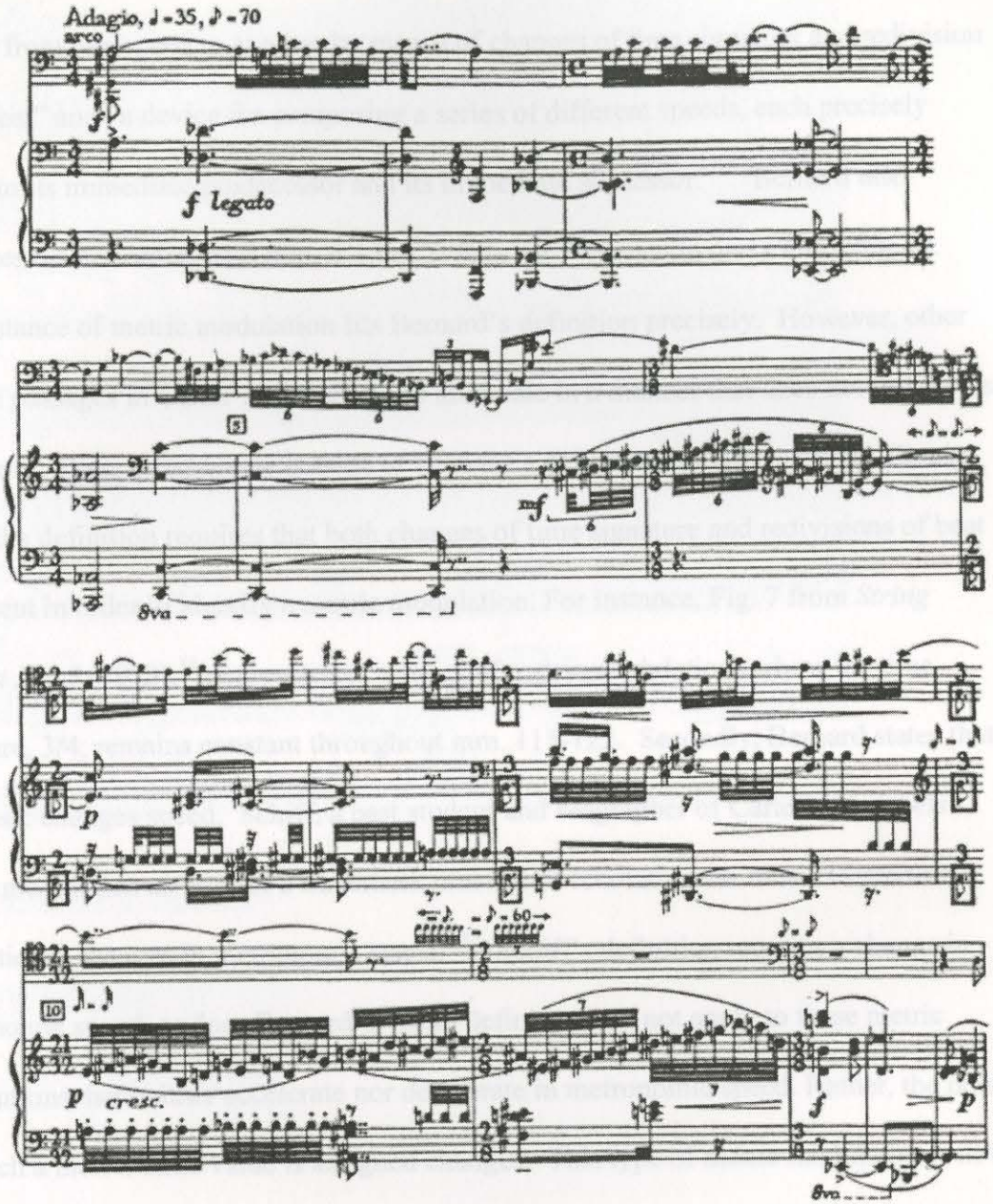

Fig. 5 – *Sonata for Violoncello and Piano*, III. – mm. 1-12 – Goldman's Example #3

Metric modulation is described by Bernard as "a fixture that provides a way of moving from one speed to another by means of changes of time signature and redivision of the beat" and "a device for composing a series of different speeds, each precisely related to its immediate predecessor and its immediate successor."[10] Bernard also illustrates his definition with mm. 6-13 of *Sonata for Violoncello and Piano* (Fig. 6). This instance of metric modulation fits Bernard's definition precisely. However, other musical passages in Carter's compositions modulate in a manner that does not follow his definition. These passages lie outside of Bernard's definition for two reasons. Firstly, Bernard's definition requires that both changes of time signature and redivisions of beat be present in order to identify a metric modulation. For instance, Fig. 7 from *String Quartet No. 3* (1973),[11] demonstrates a series of metric modulations where the time signature, 3/4, remains constant throughout mm. 115-122. Secondly, Bernard states that the music changes speed. Schiff, a past student and biographer of Carter, also labels metric modulation as "Carter's trademark practice of renotating the music to produce proportional changes in metronomic speed."[12] Schiff's definition requires a change in metronomic speed, as does Bernard's. Both definitions do not apply to these metric modulations that neither accelerate nor decelerate in metronomic speed. Rather, the pulse to which a metronomic value is assigned changes. This type of metric modulation will be discussed later in further detail.

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[10] Jonathan Bernard, "The Evolution of Elliott Carter's Rhythmic Practice," *Perspectives of New Music* 26, no. 2 (1988): 168.

[11] Elliott Carter, *String Quartet No. 3*, New York: Associated Music Publishers, 1973.

[12] David Schiff, *The Music of Elliott Carter*, 2nd Edition, Ithaca: Cornell University Press, 1998. 41.

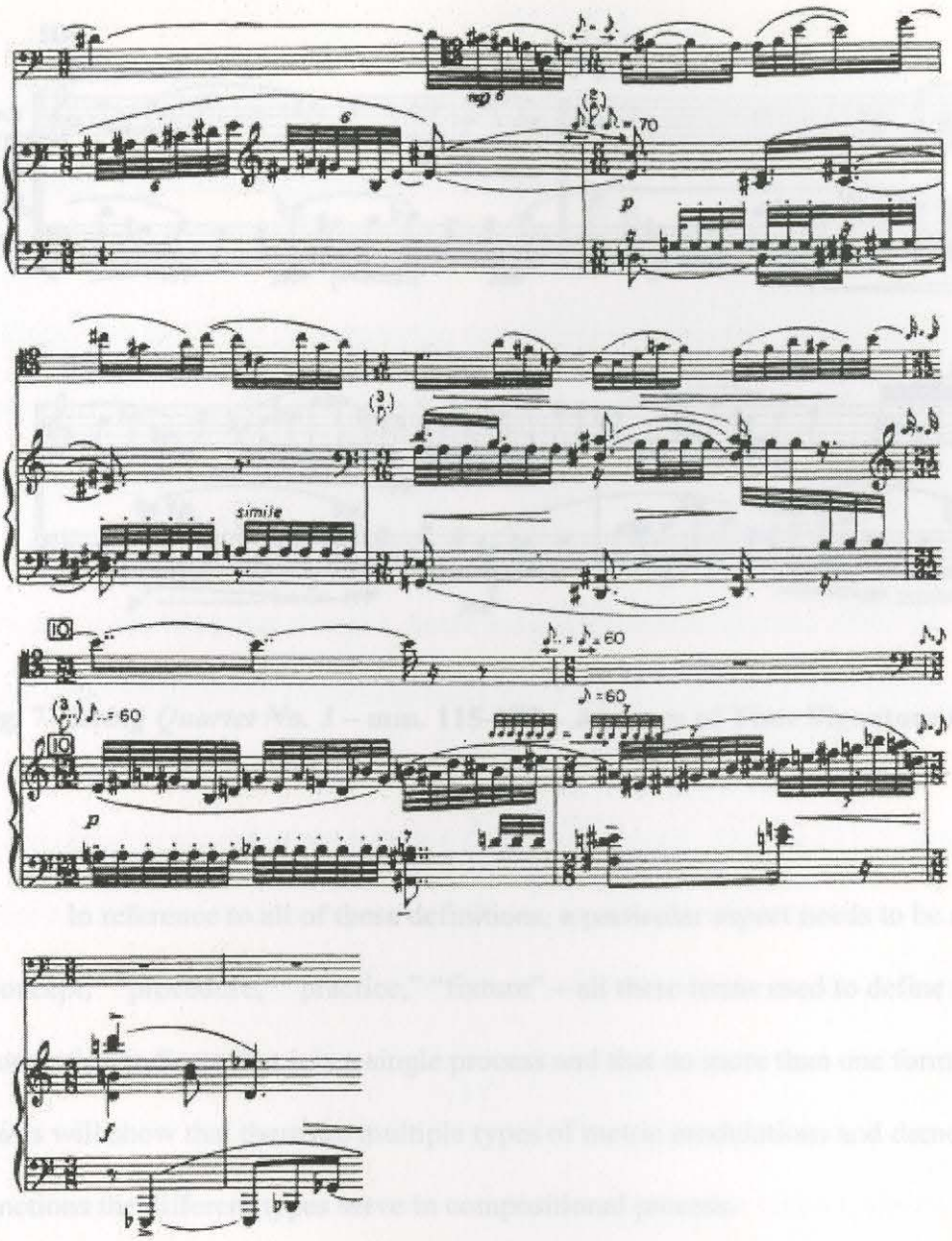

Fig. 6- ***Sonata for Violoncello and Piano*****, III. – mm. 6-13 – Bernard's Example of Metric Modulation**

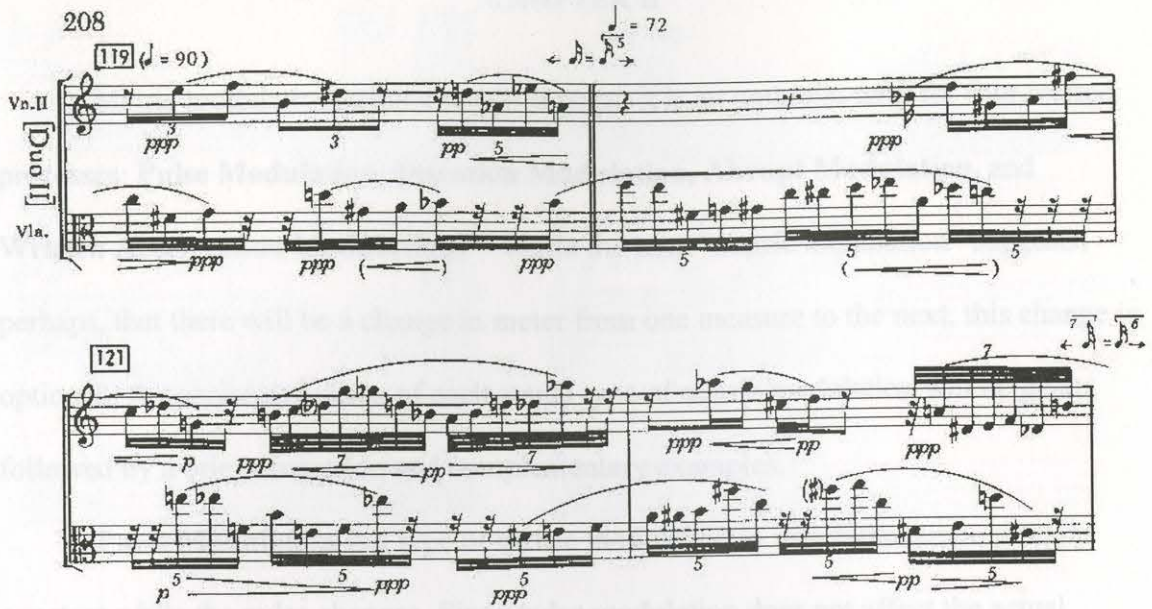

Fig. 7- *String Quartet No. 3* – mm. 115-122 – Absence of Time Signature Changes

In reference to all of these definitions, a particular aspect needs to be addressed – "concept," "procedure," "practice," "fixture" – all these terms used to define metric modulation indicate that it is a single process and that no more than one form exists. This thesis will show that there are multiple types of metric modulations and demonstrate what functions the different types serve in compositional process.

Different techniques of metric modulation will be categorized in the second chapter and formal functions associated with metric modulations will be identified in the third chapter. The fourth will be a detailed analysis of *Shard*, showing how the metric modulations in this solo guitar work contribute towards this composition's expressive shape.

CHAPTER II

Metric modulation is not a single process; it is an umbrella term for four related processes: **Pulse Modulation, Duration Modulation, Abrupt Modulation,** and **Written Accelerando Modulation**.[13] While the term "metric modulation" suggests, perhaps, that there will be a change in meter from one measure to the next, this change is optional. A concise definition of each actual type of metric modulation will be given, followed by a brief discussion and complementary examples.

Pulse Modulation is a type of metric modulation in which the tempo remains constant while the pulse changes. Since pulse modulation does not affect the actual tempo, the duration of a given beat stays the same. For instance, any duration could be equal to any other duration in a following measure. This opens the door to a wide spectrum of proportional changes that Carter can exploit. Fig. 8 and Fig. 9 demonstrate pulse modulations with excerpts from *Sonata for Violoncello and Piano*, III, and *Eight Pieces for Timpani* (1949-66),[14] VIII. March, respectively. In Fig. 8, the pulse, a double-dotted eighth note at forty beats per minute, becomes an eighth note at forty beats per minute at m. 64. In Fig. 9, beginning in m. 35, the pulse, a double-dotted quarter note at sixty-four beats per minute, becomes a half note at sixty-four beats a minute, which later becomes a dotted quarter note at sixty-four beats per minute.

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[13] These four terms are original to this thesis and are not found in any literature about the music of Elliott Carter.

[14] Elliott Carter, *Eight Pieces for Timpani*, New York: Associated Music Publishers, 1968.

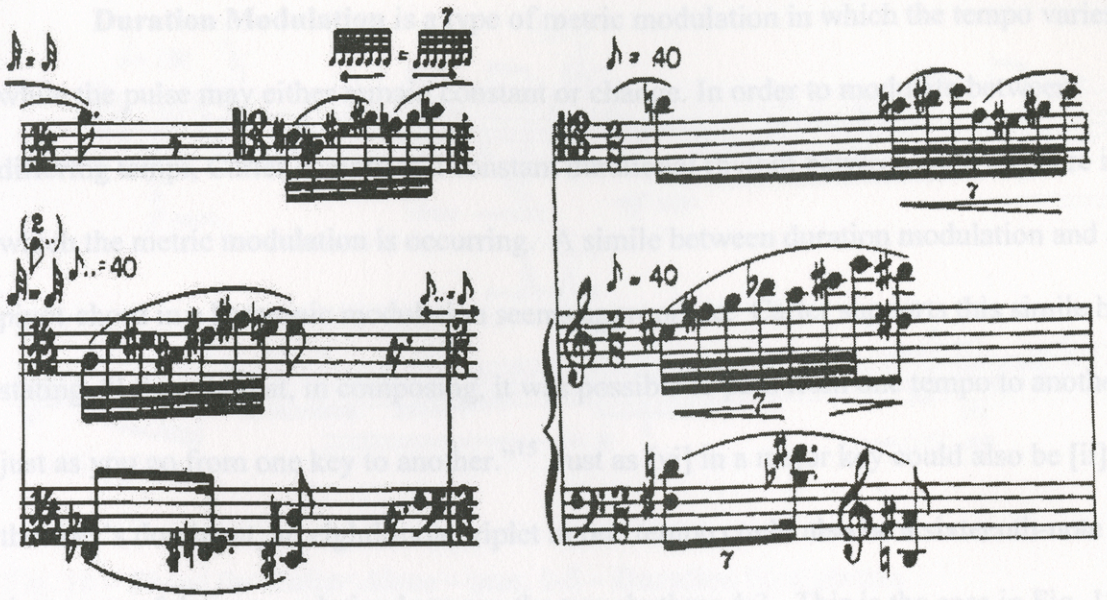

Fig. 8 – *Sonata for Violoncello and Piano*, III. – mm. 63-64 – Pulse Modulation

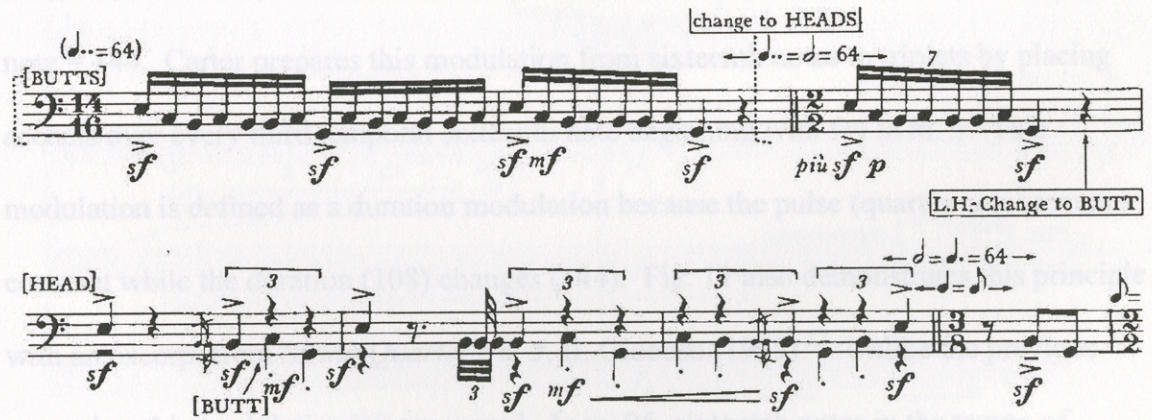

Fig. 9 – *Eight Pieces for Timpani*, VIII. March – mm. 35-41 – Pulse Modulation

Duration Modulation is a type of metric modulation in which the tempo varies, while the pulse may either remain constant or change. In order to modulate between differing tempi, Carter composes a constant durational rhythm between each measure in which the metric modulation is occurring. A simile between duration modulation and a pivot-chord in a harmonic modulation seems appropriate. Carter supports this simile by stating, "I thought that, in composing, it was possible to pass from one tempo to another just as you go from one key to another."[15] Just as [vi] in a major key could also be [ii] in that key's dominant, an eighth-note triplet in one tempo could also be a sixteenth-note in the tempo of the same relation between the two rhythms 4:3. This is the case in Fig. 10, taken from *Shard for Guitar Alone* (1997).[16] In m. 4, there are sixteenth notes at quarter note = 108. In m. 5, these sixteenth notes then become triplets in the new tempo, quarter note = 144. Carter prepares this modulation from sixteenth notes to triplets by placing accents over every third temporal sixteenth note beginning with D4 in m. 3. This modulation is defined as a duration modulation because the pulse (quarter note) remains constant while the duration (108) changes (144). Fig. 11 also demonstrates this principle with an excerpt from *String Quartet No. 5*, II. Giocoso (1995).[17] Unlike the previous examples, this modulation is unprepared. In m. 25, sixteenth notes in the tempo of quarter note = 96 become sixteenth-note triplets in the tempo of quarter note = 64 in m. 26. Because there are not sixteenth-note triplets continuing into m. 26 from m. 25, this is a unprepared duration modulation in a 4:6.

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[15] Carter, *In Conversation,* 41.

[16] Elliott Carter, *Shard for Guitar Alone*, New York: Boosey and Hawkes, 1997.

[17] Elliott Carter, *String Quartet No. 5*, New York: Boosey and Hawkes, 1995.

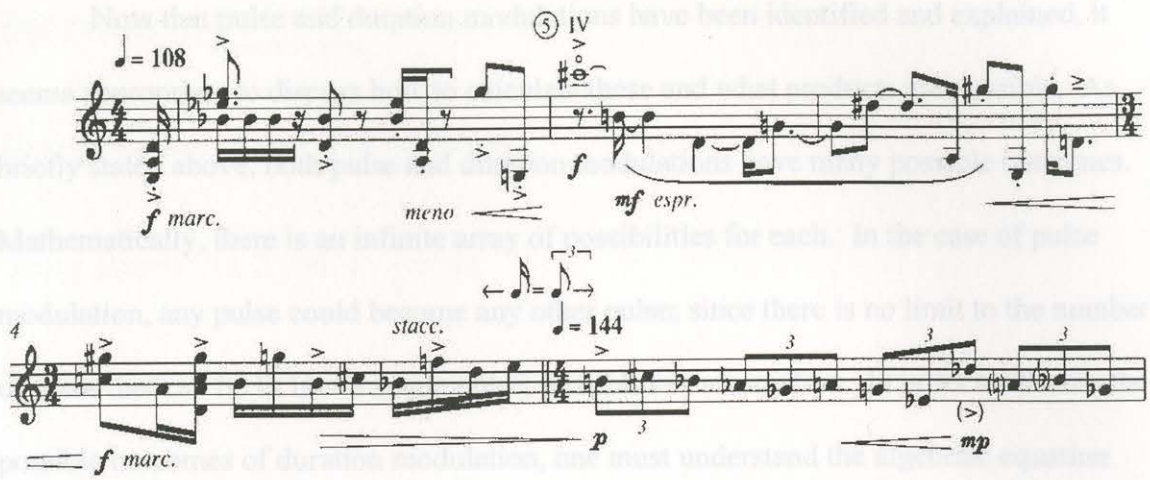

Fig. 10 – *Shard for Guitar Alone* – mm. 1-5 – Duration Modulation

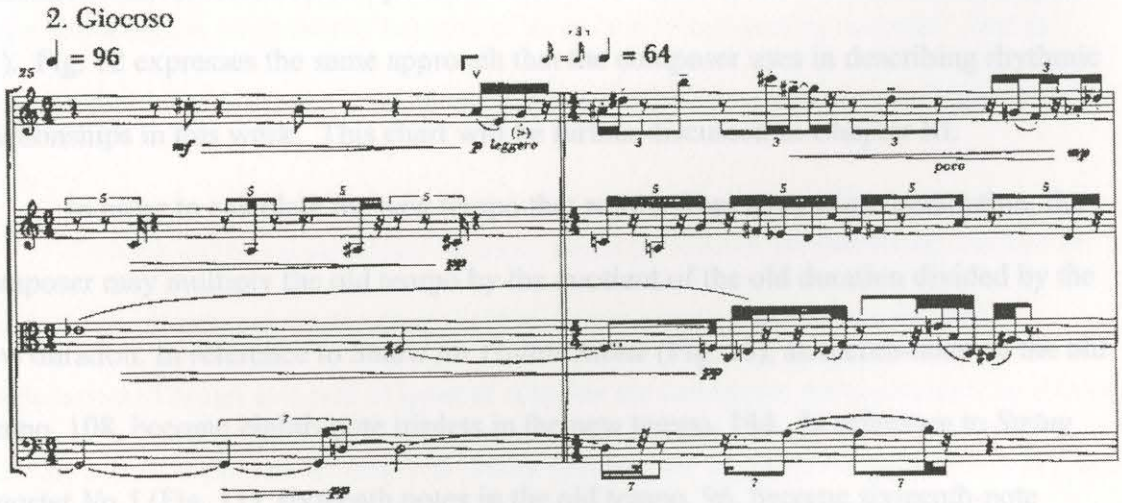

Fig. 11 – *String Quartet No. 5*, II. Giocoso– mm. 25-26 – Duration Modulation

Now that pulse and duration modulations have been identified and explained, it seems appropriate to discuss how to calculate these and what products are possible. As briefly stated above, both pulse and duration modulations have many possible outcomes. Mathematically, there is an infinite array of possibilities for each. In the case of pulse modulation, any pulse could become any other pulse; since there is no limit to the number of notes that can be fit into a single pulse, possibilities are endless. In order to discuss the possible outcomes of duration modulation, one must understand the algebraic equation needed to perform this operation (Fig. 12). It is important to note that this equation demonstrates the same logic that Carter uses to present his compositional process in the published chart of metronomic speed and interval scheme of his *Double Concerto* (1959-61). Fig. 12 expresses the same approach that the composer uses in describing rhythmic relationships in this work. This chart will be further discussed in Chapter III.

In order to calculate the new tempo that results from a duration modulation, the composer may multiply the old tempo by the quotient of the old duration divided by the new duration. In reference to *Shard for Guitar Alone* (Fig. 10), sixteenth-notes in the old tempo, 108, become eighth-note triplets in the new tempo, 144. In reference to *String Quartet No.5* (Fig. 11), sixteenth notes in the old tempo, 96, become sixteenth-note triplets in the new tempo, 64.

$$Old\ Tempo \times \frac{Old\ Duration}{New\ Duration} = New\ Tempo$$

Shard for Guitar Alone - $108 \times \frac{4}{3} = 144$

String Quartet No. 5 - $96 \times \frac{4}{6} = 64$

Fig. 12 – Duration Modulation Equation

The next two metric modulations to be discussed – **Written Accelerando Modulation and Abrupt Modulation** – deserve special attention in that they differ from pulse and duration modulations because of their lack of connecting material. Just as some harmonic modulations lack connecting material, so some metric modulations do as well.

Though metric modulations certainly could be used to systematically control an accelerando, sometimes Carter elects instead to compose a **written accelerando modulation** of tempi as a sort of general map for the conductor and performers to follow. Two instances of this can be found in *String Quartet No. 2,* IV, (1959) (Fig. 13, 14) [18] and in *Variations for Orchestra,* VI (1954) (Fig. 15, 16). [19] In Fig. 13, the initial tempo is tripled during an accelerando from the tempo of dotted-quarter note = 60 (m. 565), to the tempo of dotted-quarter note = 180 (m. 572). Carter explains that these tempi from *String Quartet No. 2* were written out "as if it were continuing a regular acceleration."[20]

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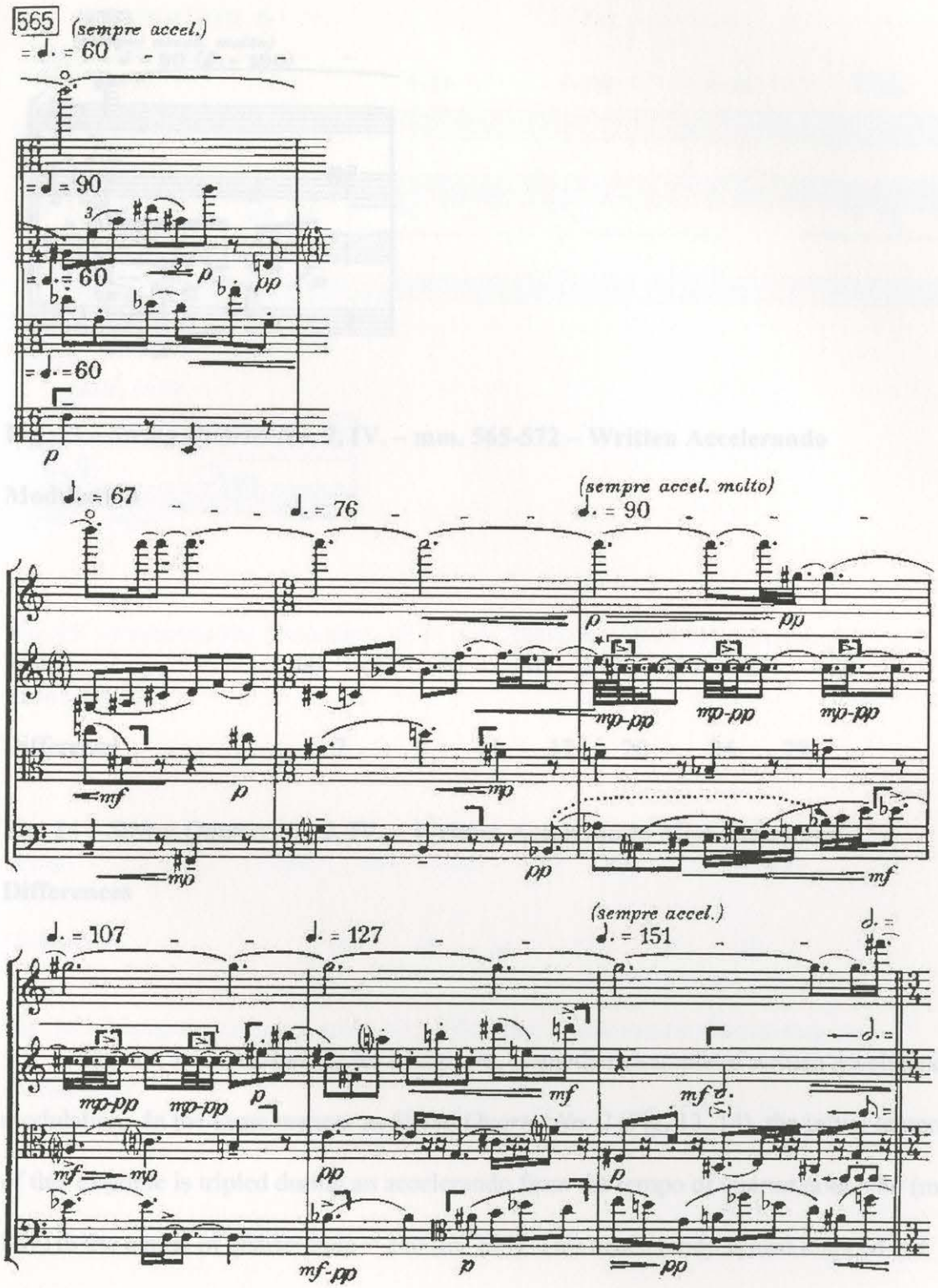
[18] Elliott Carter, *String Quartet No. 2*, New York: Associated Music Publishers, 1961.

[19] Elliott Carter, *Variations for Orchestra*, New York: Associated Music Publishers, 1957.

[20] Carter, "Time Screen," 356.

Thus, one might expect some sort of logical and formulated sequence of numbers to occur in these written accelerandi. Yet, as Fig. 14 demonstrates, these tempi are not composed as a perfectly symmetrical acceleration. The first row of Fig. 14 states the written tempi and the second row states the difference between each pair of adjacent tempi. The difference shows the asymmetry of the acceleration.


565
(sempre accel.)
♩. = 60
♩ = 90
♩. = 60
♩. = 60
♩. = 67
♩. = 76
(sempre accel. molto)
♩. = 90
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♩. = 127
(sempre accel.)
♩. = 151

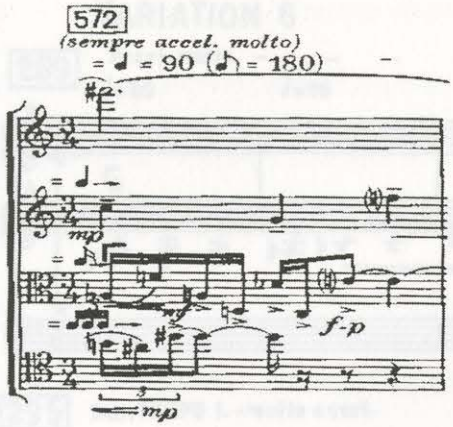

Fig. 13 – *String Quartet No. 2*, IV. – mm. 565-572 – Written Accelerando Modulation

Tempi	60	67	76	90	107	127	151	180
Difference	7	9	14	17	20	24	29	

Fig. 14 – *String Quartet No. 2*, IV. – Written Accelerando Modulation and Differences

Fig. 15, from *Variations for Orchestra,* is another example of written accelerando modulation. In the same manner as *String Quartet No. 2* (Fig. 13, 14), the initial tempo of this example is tripled during an accelerando from the tempo of quarter note = 80 (m. 289) to the tempo of quarter note = 240 (m. 295). This accelerando is also mapped out with written tempi. Correspondingly to Fig. 14, Fig. 16 shows that the acceleration is asymmetric by calculating the difference between each pair of adjacent tempi.

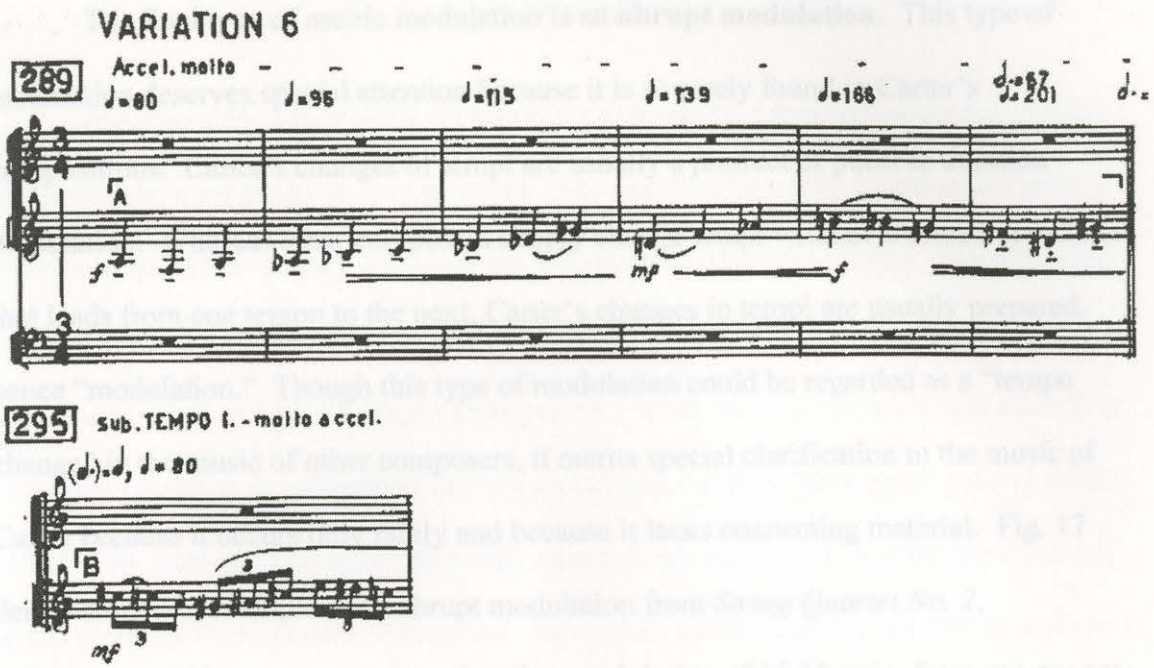

Fig. 15 – *Variation for Orchestra*, VI. – mm. 289-295 – Written Accelerando Modulation

Tempi	80	96	115	139	166	201	240
Difference		16	19	24	27	35	39

Fig. 16 – *Variation for Orchestra*, VI. – Written Accelerando Modulation and Differences

The final type of metric modulation is an **abrupt modulation.** This type of modulation deserves special attention because it is so rarely found in Carter's compositions. Carter's changes of tempi are usually a product of pulse or duration modulation. Whereas other composers simply change tempi without connecting material that leads from one tempo to the next, Carter's changes in tempi are usually prepared, hence "modulation." Though this type of modulation could be regarded as a "tempo change" in the music of other composers, it merits special clarification in the music of Carter because it occurs only rarely and because it lacks connecting material. Fig. 17 demonstrates an example of an abrupt modulation from *String Quartet No. 2*, Introduction. What appears to be a duration modulation of 16:15 ratio, from quarter note = 105 to quarter note = 112, occurs during the beginning of "subito meno mosso" section. However, since there is no transitional material appearing in a 16:15 ratio, this can truly be understood as an abrupt modulation.

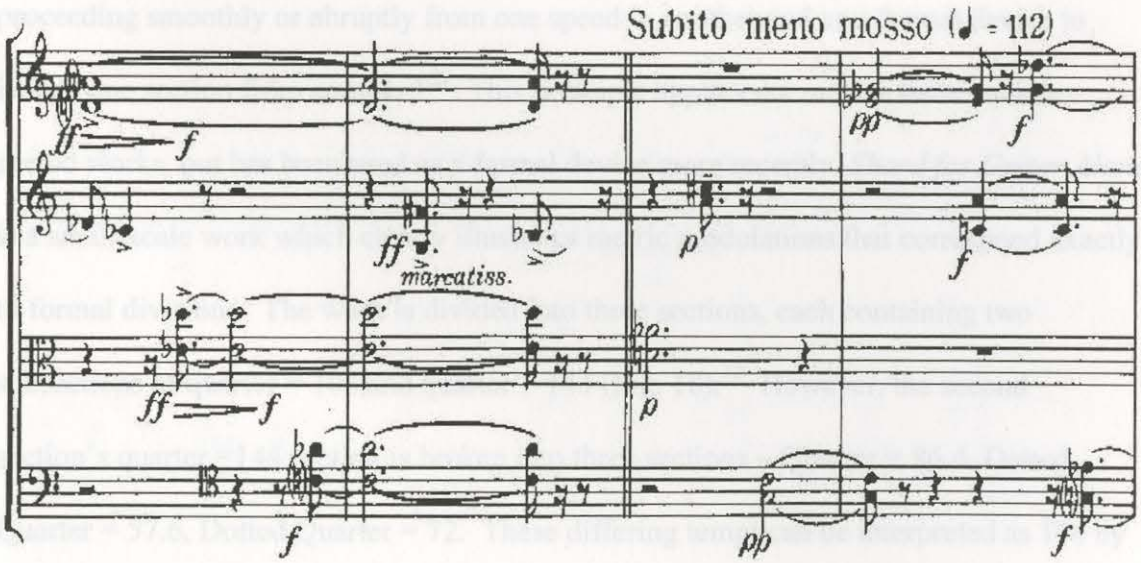

Fig. 17 – *String Quartet No. 2*, Introduction – mm. 27-30 – Abrupt Tempo Change

CHAPTER III

Having defined four different processes that can be subsumed under the general rubric of metric modulation, it remains for us to consider how they function in Carter's compositions. How do they influence the construction of musical form? The following musical purposes are served by metric modulation: (1) Formal Division, (2) Transition, (3) Time Control and (4) Character Designation. While no claim is made that these four functions comprise an exhaustive list of musical possibilities, these functions commonly occur in the analytical literature about his music (both in the work of other theorists and in the composer's published comments). Next, each function on the list will be discussed and a representative musical example will be provided.

Metric modulation for the purpose of **formal division** has been discussed by Carter in reference to *String Quartet No. 2*, *Double Concerto* and *Piano Concerto* (1964) –"In these works, all kinds of uses were made of metric modulation, both as a mode of proceeding smoothly or abruptly from one speed to another and as a formal device to isolate one section from another."[21] This principle applies not only to these middle period works, but has been used as a formal device more recently. *Shard for Guitar Alone* is a small-scale work which clearly illustrates metric modulations that correspond exactly to formal divisions. The work is divided into three sections, each containing two subsections of quarter = 108 and quarter = 144 (Fig. 18).[22] However, the second section's quarter =144 section is broken into three sections – Quarter = 86.4, Dotted Quarter = 57.6, Dotted Quarter = 72. These differing tempi can be interpreted as 144 by

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[21] Carter, "Time Screen," 356.

[22] In the "Internal Sections" portion of the chart, "t" stands for "transition," not a section of the form.

adding 86.4 and 57.6 and viewing 72 as a **transition** back to 108 (Fig. 19). Because of the highly impractical 15:8 ratio needed to perform a modulation back to 108 from 57.6, two more practical modulations, from 57.6 to 72 (5:4) and 72 to 108 (3:2) are composed. This development of tempi in the second section allows for continuity among all three sections while simultaneously creating contrast between the outer two. These divisions of differing tempi permit a logical interpretation of ternary form.

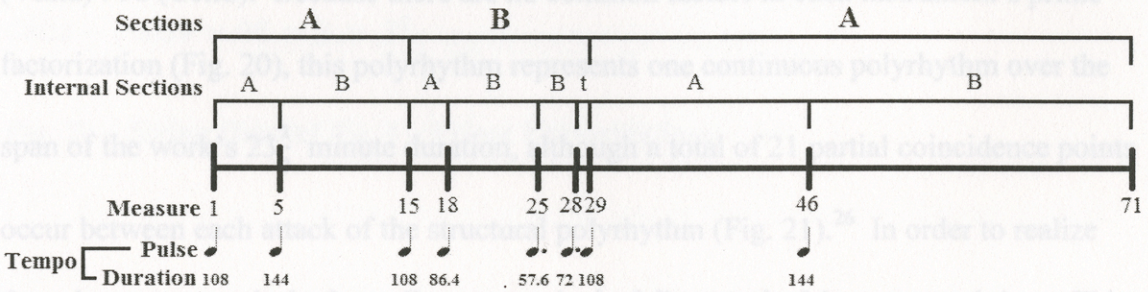

Fig. 18 – *Shard for Guitar Alone* – Formal Division

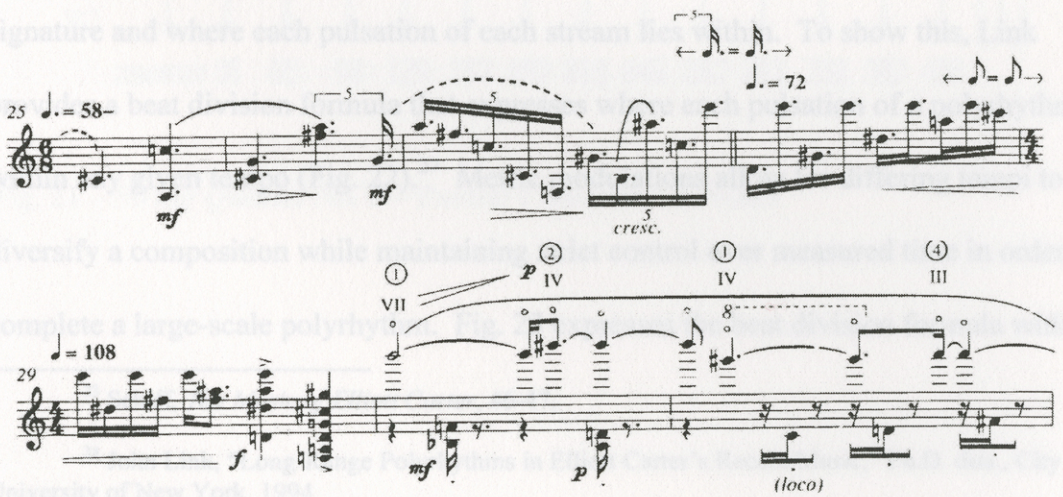

Fig. 19 – *Shard for Guitar Alone* – mm. 25-31 – Transition

While Carter makes frequent use of small-scale polyrhythms, many of his later works illustrate his use of large-scale polyrhythms, or "structural polyrhythms."[23] John Link's 1994 dissertation, "Long-Range Polyrhythms in the Recent Music of Elliott Carter", addresses theoretical aspects, the composition process, and formal aspects of structural polyrhythms.[24] The polyrhythm reaching over the course of Carter's *String Quartet No. 4* (1986)[25] contains four streams - 120 (Violin I) : 126 (Violin II) : 175 (Viola) : 98 (Cello). Because there are no common factors in each instrument's prime factorization (Fig. 20), this polyrhythm represents one continuous polyrhythm over the span of the work's $23\frac{1}{3}$ minute duration, although a total of 21 partial coincidence points occur between each attack of the structural polyrhythm (Fig. 21).[26] In order to realize these long-range polyrhythms, Carter must be in full control of the measured time. This **time control** can either be achieved by remaining in one constant tempo throughout the entire work, extremely unlikely given the rhythmic vocabulary of Carter, or to be fully aware of the units of measured time produced by any given tempo in any given time signature and where each pulsation of each stream lies within. To show this, Link provides a beat division formula that expresses where each pulsation of a polyrhythm lies within any given tempo (Fig. 22).[27] Metric modulations allow for differing tempi to diversify a composition while maintaining strict control over measured time in order to complete a large-scale polyrhythm. Fig. 23 expresses the beat division formula with

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[23] Schiff, *The Music of Elliott Carter*, 46-47.

[24] John Link, "Long-Range Polyrhythms in Elliott Carter's Recent Music," Ph.D. diss., City University of New York, 1994.

[25] Elliott Carter, *String Quartet No. 4,* New York: Boosey and Hawkes, 1986.

[26] John Link, "Long-Range Polyrhythms," 97.

[27] Ibid, 33.

every tempo contain within this work.

$$Violin\ I - Pulse = 120 = 2^3 \times 3 \times 5$$

$$Violin\ II - Pulse = 126 = 2 \times 3^2 \times 7$$

$$Viola - Pulse = 175 = 5^2 \times 7$$

$$Cello - Pulse = 98 = 2 \times 7^2$$

Fig. 20 – *String Quartet No. 4* – Prime Factorizations

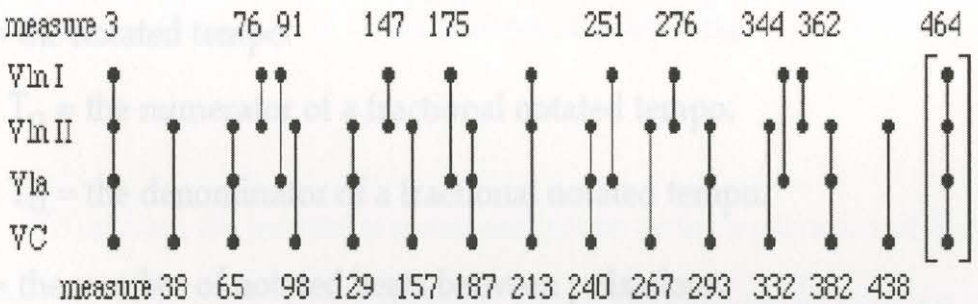

Fig. 21 – *String Quartet No. 4* – Partial Coincidence Points

$$B = \frac{T \times C}{P} = \frac{\frac{T_n}{T_d} \times \frac{C_n}{C_d}}{P} = \frac{T_n \times C_n}{T_d \times C_d \times P}$$

P = the pulsation total of a polyrhythmic stream.

P_i = the pulsation total of the 'i'th stream of a polyrhythm.

C = the cyclic duration of a polyrhythm.

C_n = the numerator of a fractional cyclic duration.

C_d = the denominator of a fractional cyclic duration.

S = the speed of a polyrhythmic stream (measured in pulsations per minute).

S_i = the speed of the 'i'th stream of a polyrhythm.

T = the notated tempo.

T_n = the numerator of a fractional notated tempo.

T_d = the denominator of a fractional notated tempo.

B = the number of notated beats between pulsations.

Fig. 22 – Beat Division Formula

Tempo = 63 – Violin I = $12\frac{1}{4}$; Violin II = $11\frac{2}{3}$; Viola = $8\frac{2}{5}$; Cello = 15

Tempo = 84 – Violin I = $16\frac{1}{3}$; Violin II = $15\frac{5}{9}$; Viola = $11\frac{1}{5}$; Cello = 20

Tempo = 54 – Violin I = $10\frac{1}{2}$; Violin II = 10; Viola = $7\frac{1}{5}$; Cello = $12\frac{6}{7}$

Tempo = 72 – Violin I = 14; Violin II = $13\frac{1}{3}$; Viola = $9\frac{3}{5}$; Cello = $17\frac{1}{7}$

Tempo = 42 – Violin I = $8\frac{1}{6}$; Violin II = $7\frac{7}{9}$; Viola = $5\frac{3}{5}$; Cello = 10

Tempo = 94.5 – Violin I = $18\frac{1}{3}$; Violin II = $17\frac{1}{2}$; Viola = $12\frac{3}{5}$; Cello = $22\frac{1}{2}$

Tempo = 45– Violin I = $8\frac{3}{4}$; Violin II = $8\frac{1}{3}$; Viola = 6; Cello = $10\frac{5}{7}$

Fig. 23 – *String Quartet No. 4* – Beat Divisions for All Tempi

To reiterate, the purpose of metric modulation during the function of time control is to be fully aware of the units of measured time produced by any given tempo in order to place a given polyrhytmic stream's pulsations in the correct place. In order to avoid coinciding attacks between each instrument of *String Quartet No. 4*, Carter assigns a different rhythmic division to each instrument and avoids downbeat attacks between them. Ironically, to modulate from one tempo to the next, whichever instrument contains the connected material music plays in the ratio of the modulation. For instance, Violin I typically plays in duple rhythms throughout. However, to achieve a duration modulation in the ration of 7:8 (Quarter = 72 – Quarter 63), Violin I breaks its typical rhythmic

assignments and presents a flourish of septuplets in order to realize the connecting material between tempi (Fig. 24).

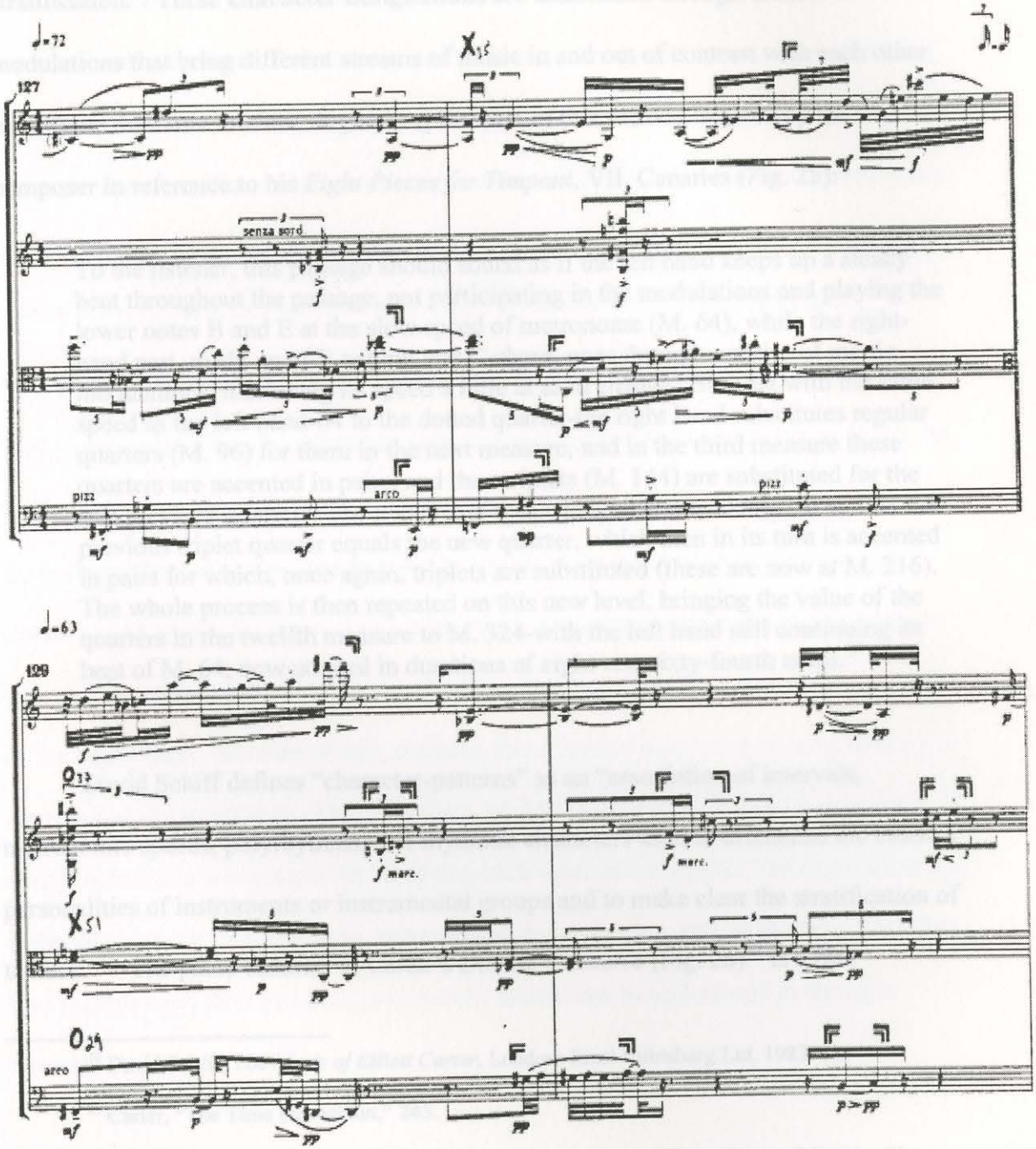

Fig. 24 – *String Quartet No. 4*, II. – mm. 127-130 – Rhythmic Deviation

Carter frequently uses metric modulations as a means to create "music out of simultaneous oppositions"[28] by establishing different characters and streams of stratification.[29] These **character designations** are established through metric modulations that bring different streams of music in and out of contrast with each other by oblique rhythmic motion. A great explanation of this method is given by the composer in reference to his *Eight Pieces for Timpani*, VII. Canaries (Fig. 25):

> To the listener, this passage should sound as if the left hand keeps up a steady beat throughout the passage, not participating in the modulations and playing the lower notes B and E at the slow speed of metronome (M. 64), while the right-hand part, made up of F-natural and C-sharp, goes through a series of metric modulations, increasing its speed a little at each change. Starting with the same speed as the left hand-64 to the dotted quarter-the right hand substitutes regular quarters (M. 96) for them in the next measure, and in the third measure these quarters are accented in pairs, and then triplets (M. 144) are substituted for the two previous quarters. The notation is then changed at the double bar so that the previous triplet quarter equals the new quarter, which then in its turn is accented in pairs for which, once again, triplets are substituted (these are now at M. 216). The whole process is then repeated on this new level, bringing the value of the quarters in the twelfth measure to M. 324-with the left hand still continuing its beat of M. 64, now notated in durations of eight-one sixty-fourth notes.[30]

David Schiff defines "character-patterns" as an "association of intervals, metronomic speeds, polyrhythms, and rhythmic characters used to dramatize the musical personalities of instruments or instrumental groups and to make clear the stratification of texture."[31] The piano cadenza in Carter's *Double Concerto* (Fig. 26)[32] is a fine

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[28] David Schiff, *The Music of Elliott Carter*, London: Ernst Eulenburg Ltd, 1983: 13.

[29] Carter, "The Time Dimension," 245.

[30] Elliott Carter, "Music and the Time Screen," *The Writings of Elliott Carter*, Edited by Else Stone and Kurt Stone, Bloomington: Indiana University Press, 1976: 349-50.

[31] Schiff, *The Music of Elliott Carter*, 2nd Edition, 36.

[32] Elliott Carter, *Double Concerto*, New York: Associated Music Publishers, 1964.

representation of all four qualities of character-patterns. This work separates the two soloists (piano and harpsichord) in all four of these ways. Fig. 22[33] is a chart made by Carter that associates a specific interval with each instrument and then measures the time between each recurrence of the motivic interval as a metronomic speed. Though Carter displays these ratios of speeds metronomically, they are actually written in differing rhythmic durations that could theoretically be seen as multiple simultaneous metronomic speeds. For instance, in Fig. 27 Carter's chart states that the major second of the piano occurs in the metronomic speed of 25 when it is notated on the score using the metronomic speed of quarter note = 105 with a rhythmic duration of $4\frac{1}{5}$ quarter notes. This pattern of supposed metronomic speeds is realized by rhythmic durations in Fig. 28. Underneath the cadenza in the published score, Carter provides an open score version of the cadenza that makes the stratification of texture more easily understood (Fig. 29).[34] Carter's chart shows the interval of a major sixth at the metronomic speed of 21 (whole note tied to a quarter note). However, the other four voices attack before the next attack of the major sixth. Because of this, realizing this stratified layer of rhythm by looking at the actual score is difficult. The open score version separates the layers into a more easily understood presentation by assigning each layer its own staff. The major sixth's assigned rhythmic value becomes more evident by giving it a staff of its own. The other four intervals and their assigned metronomic speeds can be understood in the same manner.

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[33] Elliott Carter, "The Orchestral Composer's Point of View," *The Writings of Elliott Carter*, Edited by Else Stone and Kurt Stone, Bloomington: Indiana University Press, 1965: 293.

[34] Elliott Carter, *Double Concerto*, New York: Associated Music Publishers, 1964.

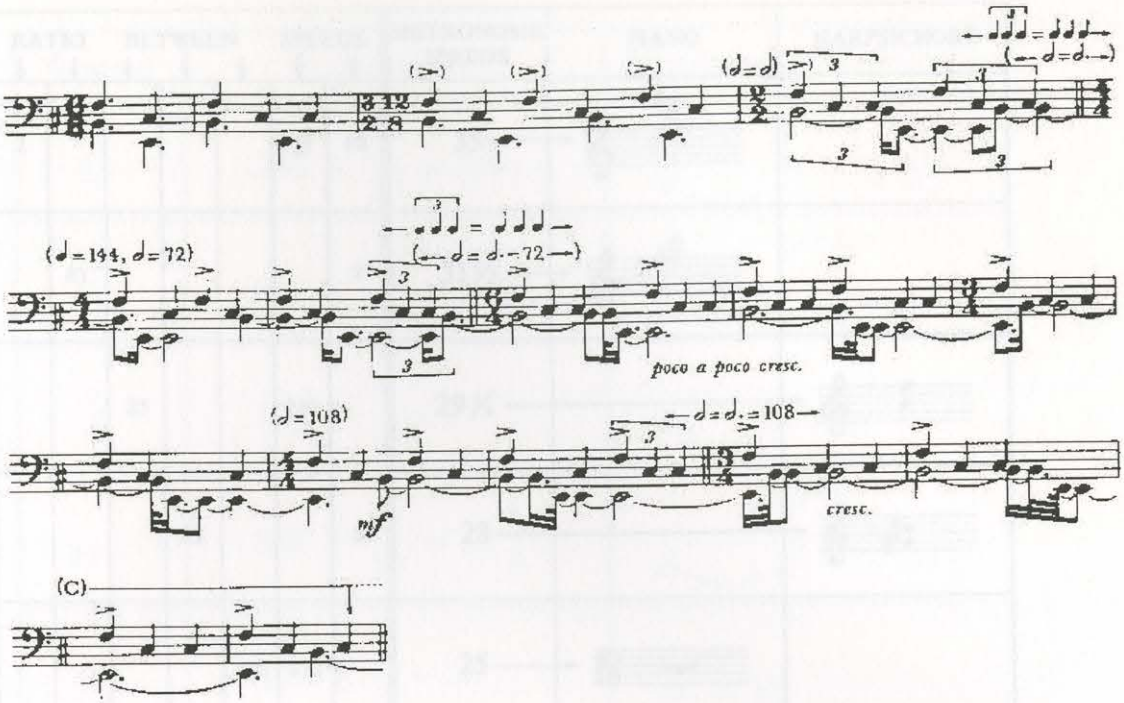


Fig. 25 – *Eight Pieces for Timpani*, VII. Canaries – mm. 61-75 – Character Designation

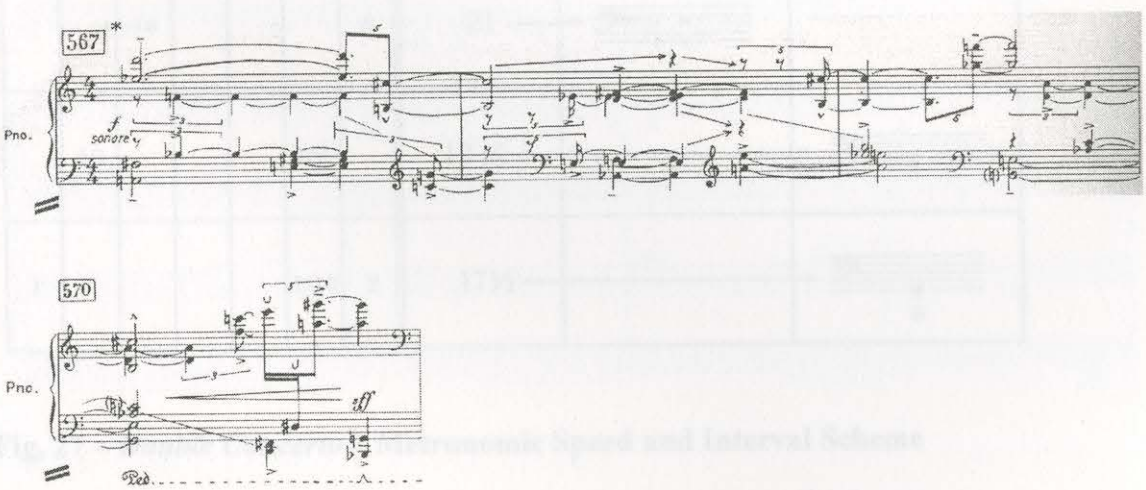


Fig. 26 – *Double Concerto* – mm. 567-570 – Piano Cadenza

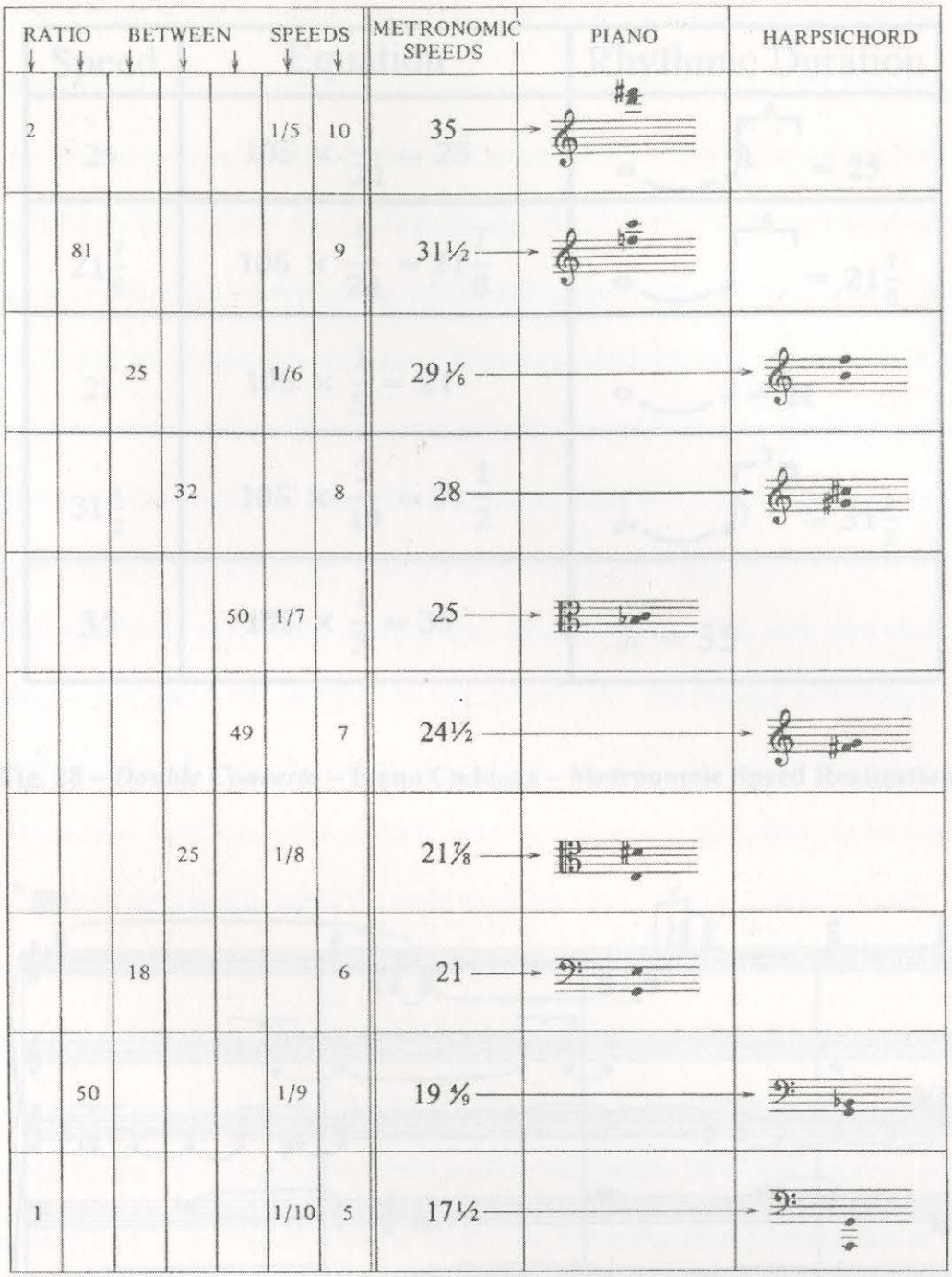


Fig. 27 – *Double Concerto* – Metronomic Speed and Interval Scheme

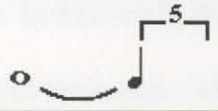
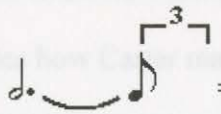
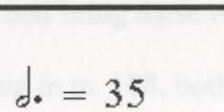
Speed	Equation	Rhythmic Duration
25	$105 \times \frac{5}{21} = 25$	
$21\frac{7}{8}$	$105 \times \frac{5}{24} = 21\frac{7}{8}$	
21	$105 \times \frac{1}{5} = 21$	
$31\frac{1}{2}$	$105 \times \frac{3}{10} = 31\frac{1}{2}$	
35	$105 \times \frac{1}{3} = 35$	

Fig. 28 – *Double Concerto* – Piano Cadenza – Metronomic Speed Realization

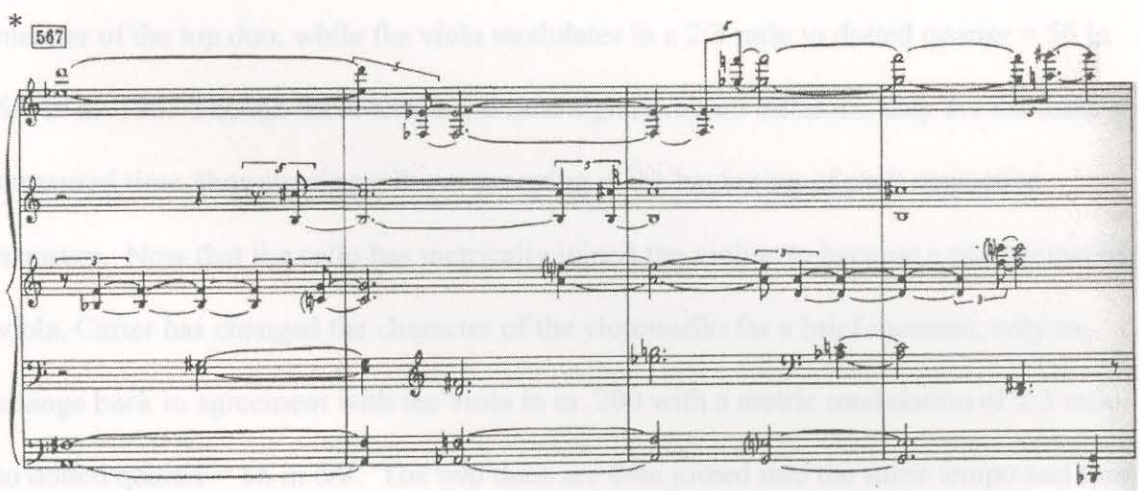
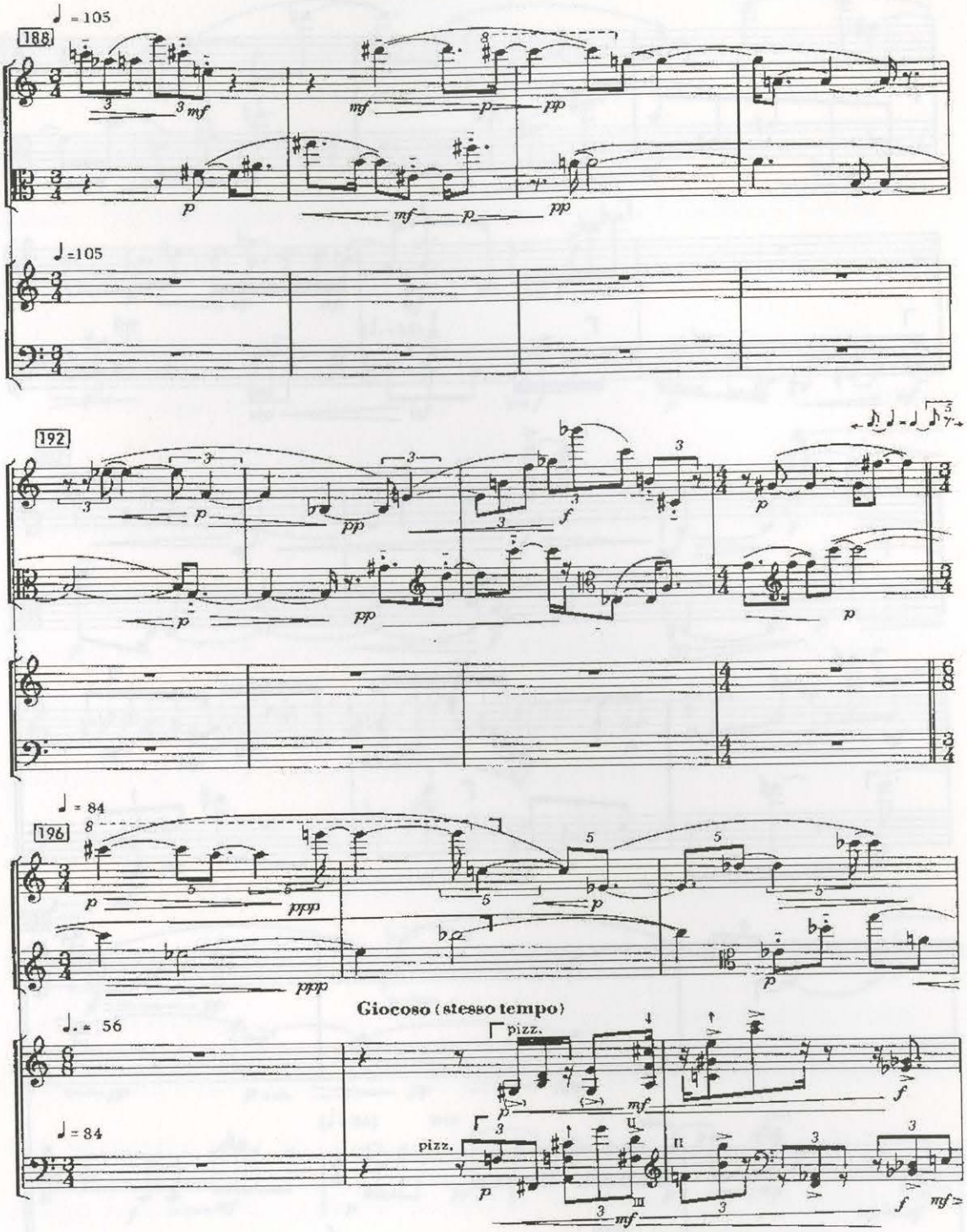


Fig. 29 – *Double Concerto* – mm. 567-570 – Piano Cadenza Reduction

These multiple speeds of contrapuntal voices are realized through rhythmic durations by a single pianist. If an ensemble of five were specified for this cadenza, it would have been possible for Carter to compose in five differing tempi and time signatures. This is the case in *String Quartet No. 3*. In this work, the four instruments are set in two duos – a duo of two violins and a duo of viola and violoncello – not only by the placement of performers on stage, but also by differing time signatures and tempo assigned to each group. Though each group is divided by these musical aspects, they are joined in actual measured time. Fig. 30 demonstrates how Carter manages to write in two differing time signatures and tempi simultaneously and bring these two duos together by sharing a tempo with metric modulations. Beginning in m. 188, both duos share the tempo of quarter = 105 and the time signature of 3/4. The top duo, two violins, modulates in a 4:5 ratio to quarter note = 84 in 3/4, while the bottom duo, viola and violoncello, splits into a duo of itself, with the violoncello modulating in the same manner of the top duo, while the viola modulates in a 2:3 ratio to dotted quarter = 56 in 6/8 in m. 196. Though these tempi and time signatures are different, they are the same in measured time, thus creating a linear grouping at the beginning of each respective measure. Now that the cello has metrically joined the violins to become a trio against the viola, Carter has changed the character of the violoncello for a brief moment, only to change back in agreement with the viola in m. 200 with a metric modulation of 2:3 ratio to dotted quarter = 56 in 6/8. The two duos are then joined into the same tempo and time signature of quarter = 84 and 3/4 in m. 206 with a metric modulation in 3:2 ratio in the bottom duo. Throughout these metric modulations, Carter manages to bring the two duos out of concurring tempi and time signatures, establish a trio against the viola, return

metrically to have the two duos in opposition, then metrically modulate the different instruments to where they can form a temporal concurrence.

The four previously discussed functions of metric modulations clarify otherwise puzzling musical events. In music as complex as Carter's, any grasp of functionality or purpose is extremely beneficial to any musician. Understanding of these functions can lead a listener's ear and a performer's interpretations of Carter's music into a more enjoyable and momentous musical experience.


♩ = 105
188
mf
p
pp
mf
p
pp
♩=105
192
p
pp
f
p
p
pp
♩ = 84
196
p
ppp
p
ppp
p
Giocoso (stesso tempo)
♩. = 56
pizz.
p
mf
f
♩ = 84
pizz.
p
mf
f
mf

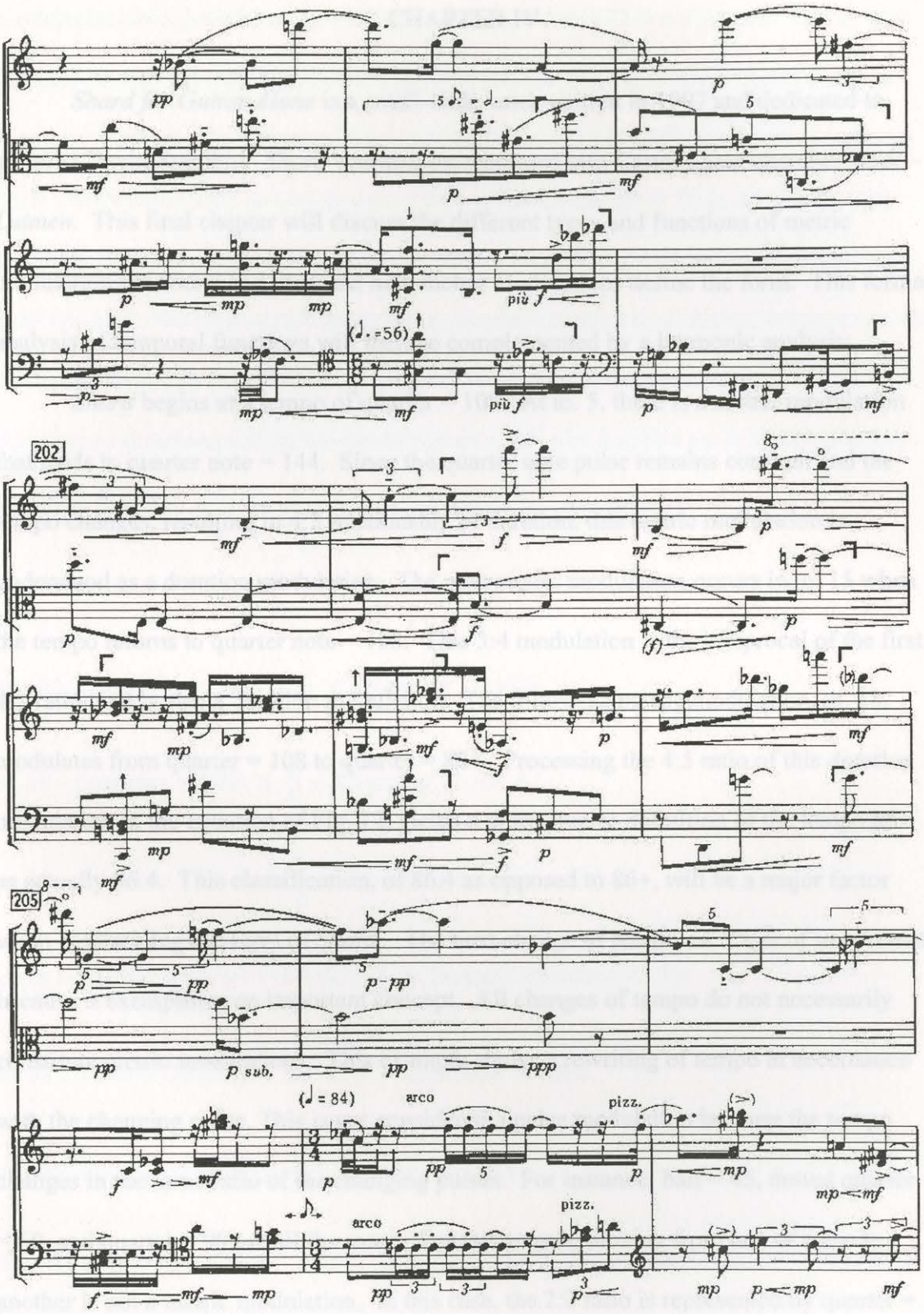


Fig. 30 – *String Quartet No. 3* – mm. 188-207 – Character Designation

CHAPTER IV

Shard for Guitar Alone is a small-scale work written in 1997 and dedicated to guitarist David Starobin. *Shard* was also incorporated into Carter's next chamber work – *Luimen*. This final chapter will discuss the different types and functions of metric modulations of *Shard* and illustrate how metric modulations define the form. This formal analysis of temporal functions will then be complemented by a harmonic analysis.

Shard begins at a tempo of quarter = 108. At m. 5, there is a metric modulation that leads to quarter note = 144. Since the quarter note pulse remains constant and the tempo changes, resulting in 4:3 relationship of duration, this metric modulation is understood as a duration modulation. The next metric modulation occurs in m. 15 when the tempo returns to quarter note = 108. This 3:4 modulation is the reciprocal of the first, 4:3 ratio, and is also a duration modulation. The following metric modulation, m. 18, modulates from quarter = 108 to quarter = 86+. Processing the 4:5 ratio of this duration modulation in the equation of Fig. 12, yields a more precise definition of the tempo 86+ as actually 86.4. This classification, of 86.4 as opposed to 86+, will be a major factor when determining the form of *Shard*. The next change of tempo, m. 25, is of importance because it exemplifies an important concept. All changes of tempo do not necessarily constitute metric modulations. This example shows a rewriting of tempo in accordance with the changing pulse. This is not considered a pulse modulation because the tempo changes in the same ratio of the changing pulses. For instance, half = 45, dotted quarter = 60, and quarter = 90 are all the same. For this reason, moving from one of these to another is not a metric modulation. In this case, the 2:3 ratio is represented by quarter = 86.4 being equivalent to dotted quarter = 57.6. M.28 contains the next duration

modulation from dotted quarter = 57.6 to dotted quarter = 72 in a 5:4 ratio. Recall from Chapter III that this duration modulation's function is transition, since Carter's goal is quarter = 108 and a duration modulation from 57.6 would yield the impractical ratio of 15:8. Modulating from dotted quarter = 57.6 to dotted quarter = 72 in a 5:4 ratio, then rewriting dotted quarter = 72 to quarter = 108 in a 3:2 ratio, m.29, proves to be easier in performance. The final metric modulation, another duration modulation, occurs in m. 46 when quarter = 108 modulates to quarter = 144 in the same manner as m. 5. These duration modulations and tempo rewritings are shown in duration modulation equation format in Fig. 31.

m.5 – Quarter = 108 $\times \frac{4}{3}$ **= Quarter = 144**

m.15 – Quarter = 144 $\times \frac{3}{4}$ **= Quarter = 108**

m.18 – Quarter = 108 $\times \frac{4}{5}$ **= Quarter = 86.4**

m.25 – Quarter = 86.4 $\times \frac{2}{3}$ **= Dotted Quarter = 57.6**

m.28 – Dotted Quarter = 57.6 $\times \frac{5}{4}$ **= Dotted Quarter = 72**

m.29 – Dotted Quarter = 72 $\times \frac{3}{2}$ **= Quarter = 108**

m.46 – Quarter =-108 $\times \frac{4}{3}$ **= Quarter = 144**

Fig. 31 – ***Shard for Guitar Alone*** **– Duration Modulations and Tempo Rewritings in Duration Modulation Equation Format**

Shard not only contains multiple examples of duration modulations, it also exemplifies how metric modulations can determine a work's form, as discussed in Chapter III. Not only do the metric modulations define form, but Carter's selection of pitch-class sets corresponds with the formal sections established by metric modulations. To illustrate this point, Fig. 33 contains a harmonic analysis of *Shard*. I have boxed pitches in colors to identify different pitch-class sets for the purpose of clarity [Blue = (012478), Orange = (0137), Green = (0146)]. While all three sections of this ABA form contain many instances of the all-trichord hexachord, the A sections can be distinguished by prominent appearances of that hexachord's subsets: the all-interval tetrachords (0137) and (0146). These tetrachordal subsets are first introduced in the second and third measures of Fig. 33 (outlining the registral extremes) and as overlapping tetrachords throughout m. 4. When the A section returns (at the recurrence of the dotted-quarter-note = 72 tempo in m. 28), tetrachord (0137) returns in the same measure, followed by several instances of tetrachord (0146) occupying the registral extremes of m. 30.[35] Since both AITs, are subsets of the ATH, either AIT is embedded in any ATH. Because of this, AITs could be boxed in orange and green during any AIT. Unless presented in a completely vertical manner, where an ATH is present, I have elected to box those pitches in blue and exclude any AITs in blue and orange, making the ATH more of a form-defining pitch-class set than either AIT. In other words, AITs are only recognized when the 2 pitch-classes needed to complete the ATH from a given AIT [(0137) – (0,5); (0146) - (0,1)] are absent in surrounding materials. This harmonic analysis complements my formal analysis based on metric modulations (Fig. 32).

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[35] Hexachord 35, Tetrachords 23 and 18 in Carter's *Harmony Book* – Pitch-Class Sets 6-Z17, 4-Z29, and 4-Z15 in Allen Forte's *The Structure of Atonal Music*.

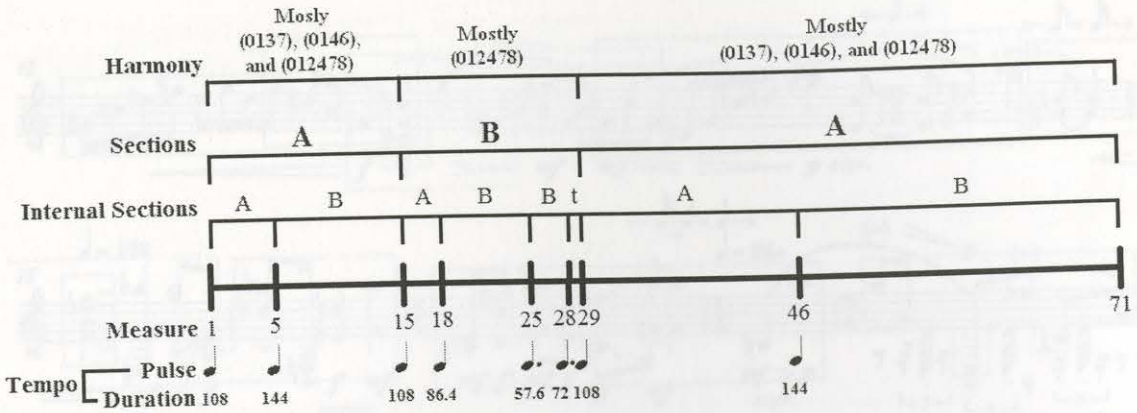
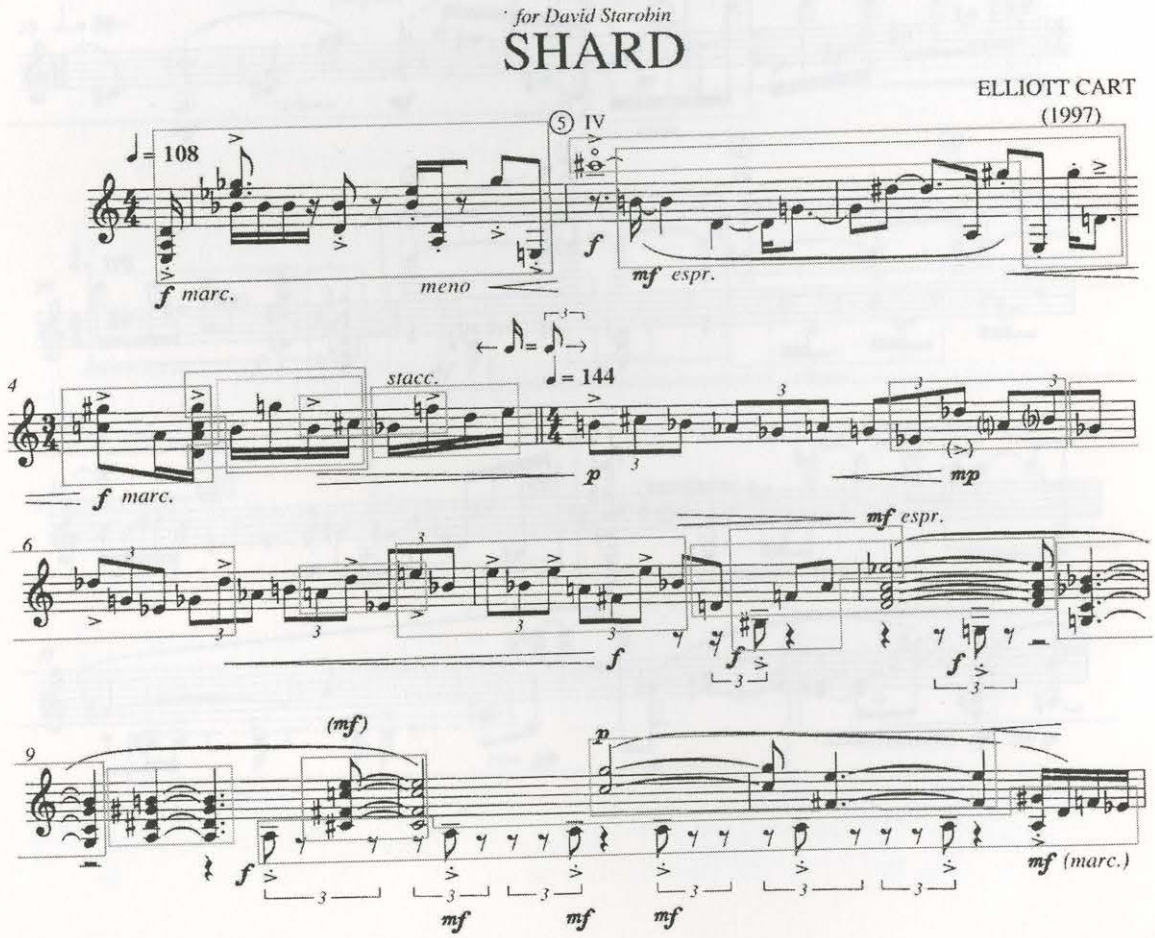
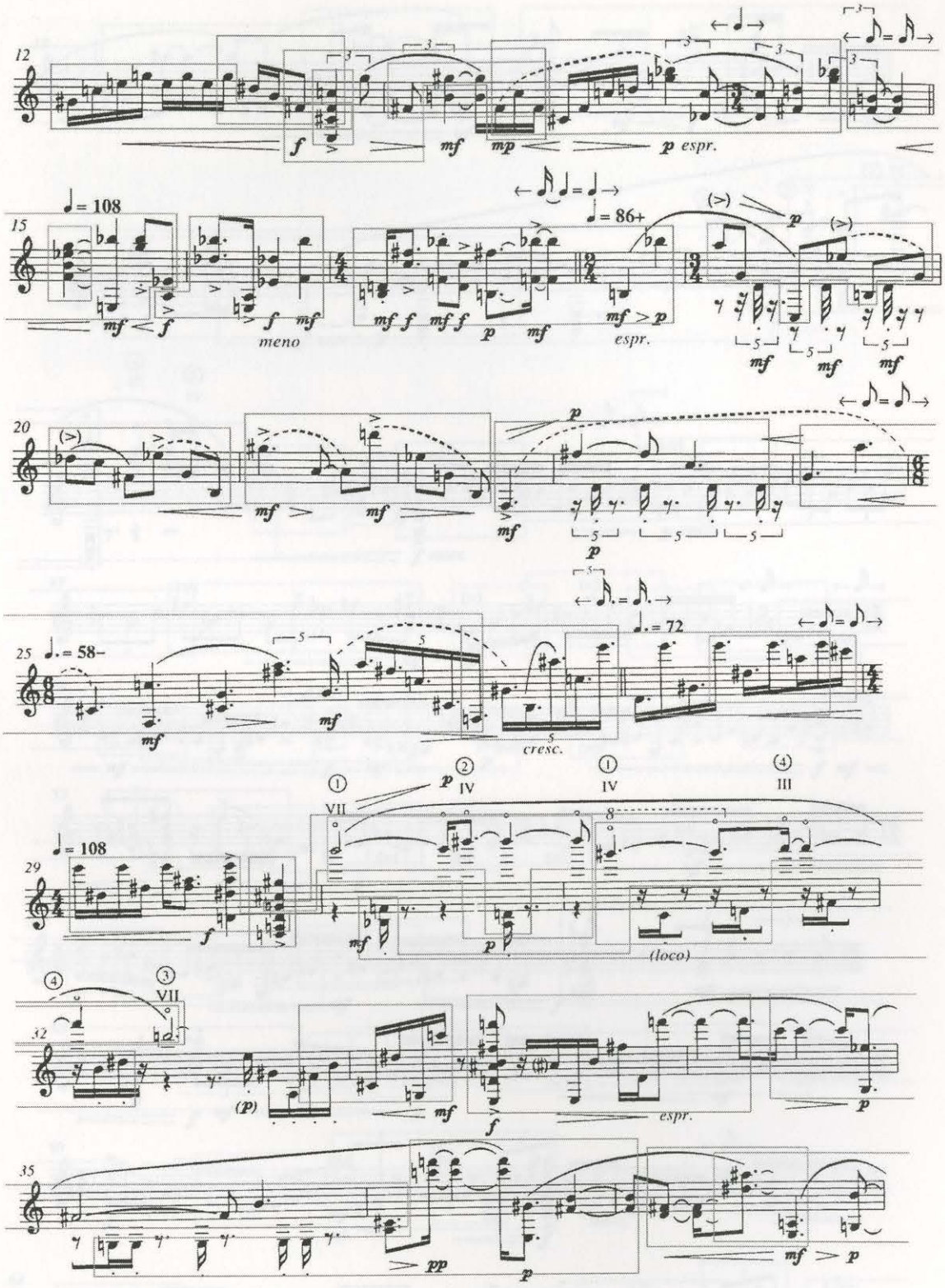
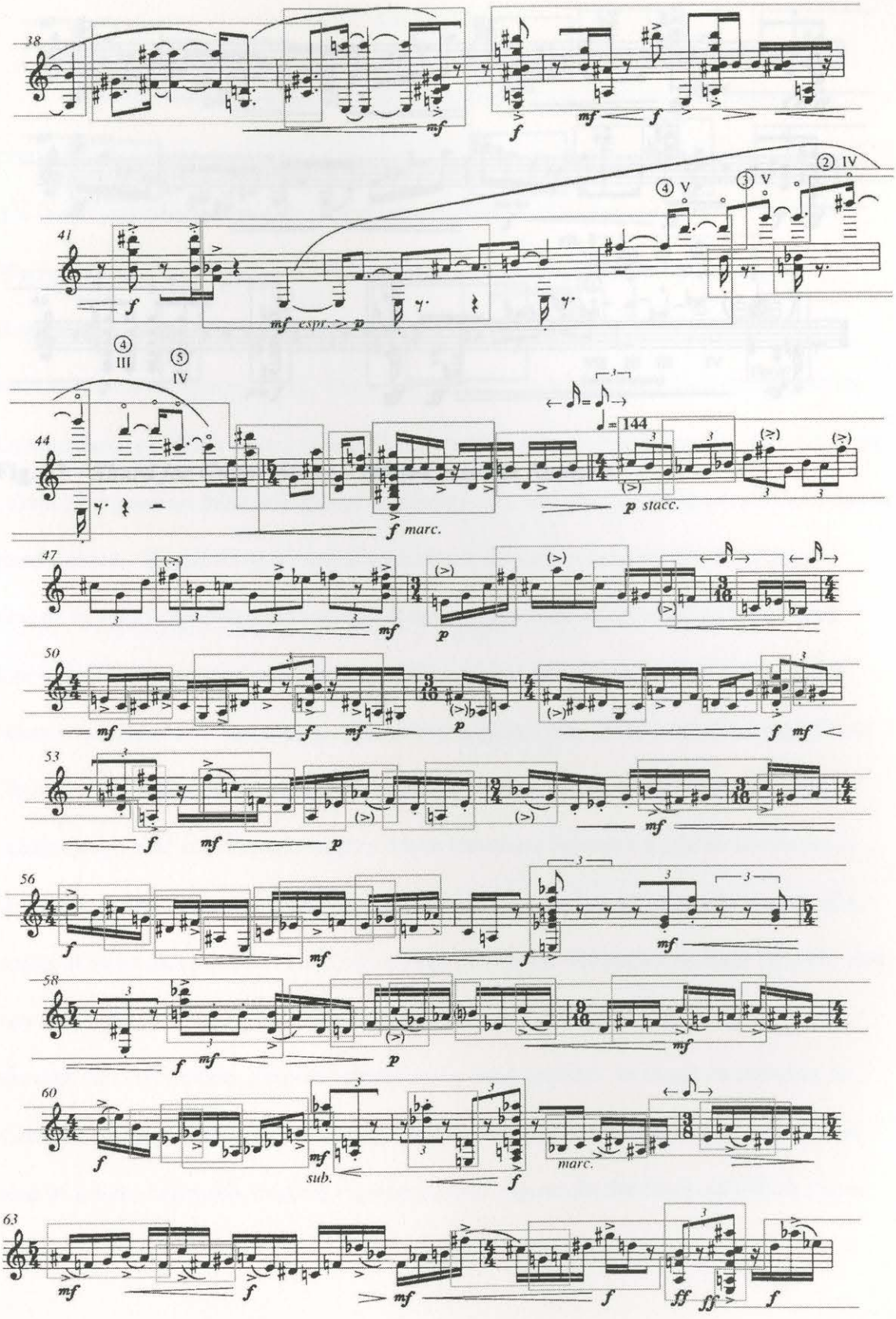


Fig. 32 – *Shard for Guitar Alone* – Metric Modulations and Harmonies Defining Form




12
f
mf
mp
p espr.
15
♩= 108
mf
f
f mf
meno
mf f mf f
p
mf
♩= 86+
mf > p
espr.
(>)
p
mf
mf
mf
20
(>)
mf
mf
mf
p
p
25
♩.= 58–
mf
mf
cresc.
♩.= 72
29
♩= 108
f
mf
p
VII
IV
IV
III
(loco)
32
(p)
mf
f
espr.
p
35
pp
p
mf > p


38
mf
f
mf
f
41
f
mf espr.
p
4 V
3 V
2 IV
4 III
5 IV
44
f marc.
144
p stacc.
47
mf
p
50
mf
f
mf
p
f
mf
53
f
mf
p
mf
56
f
mf
f
mf
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marc.
63
mf
f
mf
f
ff
ff
f

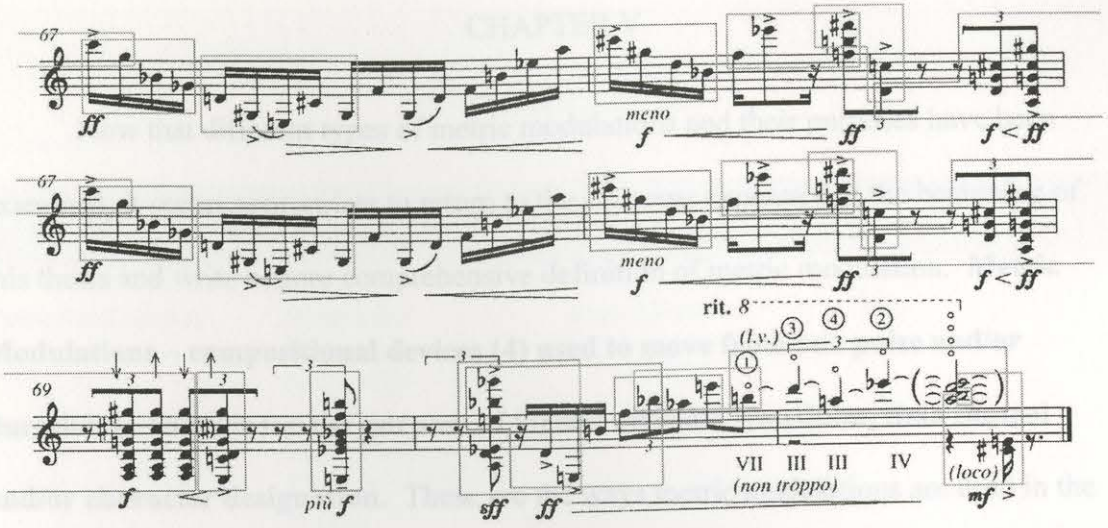

Fig. 33 – *Shard for Guitar Alone* – Pitch-Class Set Analysis

CHAPTER V

Now that different types of metric modulations and their purposes have been examined, it seems appropriate to return to the concerns expressed at the beginning of this thesis and write a more comprehensive definition of metric modulation. **Metric Modulations – compositional devices (4) used to move from one pulse and/or duration to another for the purpose of formal division, transition, time control and/or character designation.** These are the ways metric modulations are used in the compositions of Elliott Carter which I have studied; it is my hope that this will stimulate others to expand on this catalogue of different types and designated applications of metric modulations. The labeling of techniques allows for deeper inquiry into the purpose served by metric modulations and demonstrates how they affect musical form. This labeling permits comparisons between different modulations and yield deeper insight when considered over the course of an entire composition. As shown in the analysis of *Shard*, relationships of tempi were shown by a study of duration modulations. These relationships lead to a formal analysis where functions between modulations meant to designate formal areas and those meant to transition to a desired tempo by means of a series of more easily performable ratios were discussed. Through this study of types and functions of metric modulations in *Shard*, a thorough understanding was conceived; through this conception, purpose and meaning were applied. In music as complex as Carter's, any understanding of musical aspects and the compositional process can only lead to a more enjoyable musical experience and respect for the music of Elliott Carter.

APPENDIX

SUMMARY CHART

Type of Modulation	Work(s)	Measure(s)	Connecting Material
Pulse Modulation	***Sonata for Violoncello and Piano*, III.**	**mm. 63-64**	**Yes**
		mm. 35-41	**Yes**
	***Eight Pieces for Timpani*, VIII. March**		
Duration Modulation	***Shard for Guitar Alone***	**mm. 1-5**	**Yes**
	***String Quartet No. 5*, II. Giocoso**	**mm. 67-73**	**Yes**
Written Accelerando Modulation	***String Quartet No. 2*, IV.**	**mm. 565-572**	**No**
	***Variation for Orchestra*, VI.**	**mm. 289-295**	**No**
Abrupt Modulation	***String Quartet No. 2*, Introduction**	**mm. 27-30**	**No**

Function of Modulation	Work(s)	Measure(s)
Formal Division	***Shard for Guitar Alone***	**Entire Work**
Time Control	***String Quartet No. 4***	**Entire Work**
Transition	***Shard for Guitar Alone***	**m. 28**
Character Designation	***Eight Pieces for Timpani*, VII. Canaries**	**mm. 61-75**
	String Quartet No. 3	**mm. 188-207**

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